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THE ELEMENTS OF
LOGIC.

BY

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TO THE

RIGHT HON. AND MOST REV.

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AUTHOR OF

'AN OUTLINE OF THE NECESSARY LAWS OF THOUGHT,'

ETC. ETC.

THIS WORK IS,

WITH HIS KIND PERMISSION,

MOST RESPECTFULLY

INSCRIBED.

PREFACE.

THE following short treatise has been written with the view of giving the student, in a connected form, a scheme of LOGIC which, while it comprises the most useful portions of the Aristotelian or Ancient Logic, combines with them the views of modern writers of authority on the subject. Its aim is to assist, not to supersede, more extended studies in the closet or the lecture-room. For the sake of rendering the text more clear and connected, a mass of technical terms, many of them obsolete or even useless, are not noticed in the body of the work, but given in a comparative form in an Appendix.

ARDGARTAN: 15th July, 1864.

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ERRATA.

Page 29, line 2, *for* 'enunciation, speech,' *read* 'enunciative speech.'

„ 46, „ 1, *for* 'was impossible,' *read* 'is impossible.'

„ 130, „ 3, *for* 'turn' *read* 'term.'

ELEMENTS OF LOGIC.



CHAPTER I.

OF NAMES.

LOGIC is the name by which we denote alike the Science and the Art of *Reasoning*.

The correct signification of the word *Reasoning* in this definition cannot be otherwise than vaguely laid down at the commencement of a treatise on Logic; the whole object of which is to define its limits, explain its nature, and enunciate its laws. It is better to defer to a future period its formal definition, along with the critical examination of the various definitions of Logic that have been given by the principal writers on the subject, and the question of its utility as a subject of study. We shall only premise at present that, in order to uphold the definition of Logic given

above, the term Reasoning must have an extended signification, and not be confined, as it frequently is, to only one of its branches—viz. the inferring a third proposition from two propositions already given, i. e. *Syllogistic Reasoning*, or *Argumentation*; but it must have the full scope of its meaning, as *the Exercise of Reason*, or *Ratiocination*.

In treating of a Science, it is, first of all, necessary to explain the instruments used in the investigation of its principles; and, in treating of an Art, the tools employed in its practice must be described before the rules for their application can be understood. In Logic certain instruments are necessary, and they resolve themselves very clearly into two classes—Natural and Artificial. But neither class requires our attention here, both being the subjects of distinct sciences. The Natural instruments are the faculties of the human mind, which we must employ in that process of internal reflection by which we examine its own operations, and by which we handle and apply to use the Artificial instruments that we require. But the study of the faculties of the human mind is elaborate and exten-

sive; and it is, besides, serviceable not to Logic only, but to other departments of Mental Philosophy; so that it deservedly arrogates to itself the position of a separate science under the name of Pure Metaphysics, or Psychology. It is not unusual, and it is by no means useless, to give a brief outline of this science as an introduction to the study of Logic in our universities; but, in a treatise specially devoted to the latter subject, it would be out of place, as much so as it would be to introduce a treatise on Human Anatomy into a work on Astronomy, because its investigations are conducted by the eye, and the instruments employed in it are directed and governed by the hand.

Language is the Artificial instrument which we employ in Logic. In calling it *Artificial*, we do not mean to interfere with the grammatical distinction between *Natural and Artificial Language*, but simply that it is not a Natural innate endowment of humanity, like Memory or Judgment, for in that case it would be common to all mankind in the same form, and differing only in degree; but that it is the result of the operation of Reason,

which necessarily fabricates it for its use, as the smith forges tools to enable him to carry on his work, and thus it varies in its form according to the circumstances which its original modifications were designed to meet. The study of *Language as Language* is the province of the philologist and the grammarian. It is the study of words as the representative marks of the objects of thought, and their relations, that falls to the share of the logician.

Those words, or combinations of words, which represent the objects of thought, are Names.* ‘A name,’ according to Hobbes,

* ‘It is by names,’ says a French writer, Cour de Gebelin, ‘that we designate all the beings which exist. We render them known instantly by these means as if they were placed before our eyes. Thus, in the most solitary retreat, in the most profound obscurity, we are able to pass in review the universality of beings, to represent to ourselves, our parents, our friends, all that we have most dear, all that has struck our fancy, all that may instruct or amuse us; and in pronouncing their names, we may reason on them with our associates. We thus keep a register of all that is, and of all that we know; even of those things which we have not seen, but which have been made known to us by means of their relation to other things already known to us. Let us not be astonished, then, that man, who speaks of everything, who studies everything,

'is a word taken at pleasure to serve for a mark, which may raise in our mind a thought like to some thought which we had before, and which, being pronounced to others, may be to them a sign of what thought the speaker had before in his mind.'

Let us now see what Names are, by investigating their nature, and by applying method to their classification.

The first distinction which we shall notice is between *single-worded* and *many-worded* names. This is not properly a logical, but a grammatical division of names : only it is who takes note of everything, should have given names to all things that exist—to his body and its different parts, to his soul, to his faculties, to that prodigious number of beings which cover the earth, or are hid in its bosom, which fill the waters, and move in the air ; that he gives names to the mountains, the rivers, the rocks, the woods, the stars, to his dwellings, to his fields, to the fruits on which he feeds, to the instruments of all kinds with which he executes the greatest labours, to all the beings which compose his society ; or, that the memory of those illustrious persons who deserve well of mankind by their benefactions and their talents is perpetuated by their names from age to age. Man does more. He gives names to objects not in existence, to multitudes of beings as if they formed but a single individual, and often to the qualities of objects, in order that he may be able to speak of them in the same manner as he does of objects really existing.'

useful to attend to it in Logic, in order that we may have a criterion to let us know when a phrase is only a many-worded name, or is a series of names. A single-worded name is comprised in *one* word, as *horse*, *essay*; a many-worded name is composed of several words forming a phrase, as *Mansell's Bampton Lectures*, *Rowland's Macassar Oil*, or

Μῆνις...Πηληιάδεω Ἀχιλῆος
 Οὐλομένην, ἣ μυρὶ Ἀχαιοῖς ἄλγε' ἔθηκε·
 Πολλὰς δ' ἰφθίμους ψυχὰς Ἀλὶδι προΐαψεν
 Ἡρώων· αὐτοὺς δὲ ἐλώρια τεῦχε κύνεσσιν
 Οἰωνοῖσ' τε πᾶσι.

The rule or criterion which we have mentioned is:—Any number of words form a single name or several names, according as, when made the subject of an affirmation, that affirmation cannot or can be exactly replaced by several other *different* affirmations. Thus, the affirmation, *Wellington won the battle of Waterloo, the concluding victory of the last campaign against Napoleon*, cannot be replaced by the two affirmations, *Wellington won the battle of Waterloo*, and *Wellington won the concluding victory of the last campaign against Napoleon*; for each of these is identical with the other

and with the original sentence. But the affirmation, *Napoleon won the battles of Marengo, Jena, and Wagram*, is exactly replaced by the three different affirmations, *Napoleon won the battle of Marengo*, *Napoleon won the battle of Jena*, and *Napoleon won the battle of Wagram*, none of which is identical with another, nor with the original sentence. Therefore, ‘*the battle of Waterloo, which was the concluding victory of the last campaign against Napoleon*,’ is one single many-worded name, and ‘*the battles of Marengo, Jena, and Wagram*,’ are three many-worded names.

But the really important distinctions which exist among names are not connected with the number of words which compose them, but with their signification, i. e. ‘the thought raised in our mind like some thought we had before.’

The only direct sources of human knowledge are the perceptions of our bodily sensations coupled with certain innate ideas, as that of our own existence; all other knowledge is inferred from these as premises. Of all objects external to ourselves we know but the qualities, and of our mental feelings we can

only by language communicate the qualities to others. Names, then, must be marks representing the qualities of objects, *in so far as we know them*. Are names, then, really the names of things, or only the names of our concepts of things? This is merely a question of hair-splitting, and it matters not to the logician which they are ; but it seems on the whole preferable to consider that names are really the names of things. Scarcely ever can two individuals have the same concept of the same thing. Even such a name as 'stone' recalls very different thoughts in the mind of a peasant and of a philosopher. To the latter it represents a much more extensive group of qualities than to the former : indeed, even to the same individual in different periods of his life, according to the progress of his knowledge, the *name* 'stone' will change materially in the number of qualities that it stands for. Yet we do not vary it : it is the same now as when chemical analysis was unknown and the laws of attraction undiscovered ; it is the same to a Fellow of the Royal Society and to the ignorant Highland peasant, who still believes that stones grow. It must be more correct,

then, to say that the name is the name of the thing, than of our conception of it; for while the last may vary ever so much, the name and the thing remain the same.

The first great division of names is into *general* and *individual*.

✓ A *general* name applies to an indefinite number of individuals, and may be truly affirmed in the same sense of each of them. An *individual* name is only capable of being truly affirmed in the same sense of one thing. Thus, *horse* may be affirmed of every individual existing animal of the species, of all that have existed, and of all that ever will exist. But *Bucephalus* can only be affirmed of an individual horse; and even if there were more than one of the name, only one would be indicated by it. In order to indicate them all, it would require to be put in the plural with the word *all*, or in the singular with the word *every*: *all the Bucephaluses*, or *every Bucephalus*, when it becomes a *general many-worded name*. The group of qualities expressed by a *general name* are common to each individual of the indefinite number to which it may be applied; but whenever it is *applied*—

whenever, for instance, we picture to ourselves a horse in imagination, it becomes an *individual* name; *the horse* being possessed not only of all the qualities common to all horses, but of certain determinate individual qualities of height, colour, figure, &c., without which it is impossible for us to realise the concept in our mind. Thus, we never can realise a general name in our imagination, and it has, as Sir William Hamilton says, 'only a potential, not an actual universality.'*

General names vary in their *comprehension* and *extension*. Their comprehension depends on the number of qualities which form the group which they represent; their extension, on the number of individuals or objects to which those qualities apply. When we come to consider general names according to their degree of generality, as *genus*, *species*, &c., this will be more fully gone into.

Individual names are always realised in conception. Their comprehension is the maximum comprehension of any name applicable to the individual; and their extension is of course the minimum, or unity.

* Lect. on Logic, Vol. I. p. 134.

There is another class of names, which, though *individual*, are yet always applied to a number of individuals: these are *collective names*. A *collective* name cannot be affirmed or denied of each individual of the number, as a *general* name can, but only of the whole number taken together. Thus, *the present company* is a *collective* name. No single individual of those assembled can be affirmed to be *the present company*. They are individually *members* of the present company; but when *Tom, Dick, and Harry* are all here, it cannot be said *Tom is the present company*, or *Dick is the present company*, or *Harry is the present company*. Yet, *the present company* is an *individual* name, as there cannot be two or more *present* companies. *Collective* names are always *many-worded*.

The division of names into *general* and *individual*, is *complete*, or *exhaustive*, or *general*.

Another general division of names is into *concrete* and *abstract*.

A *concrete* name is a name which stands for a thing: an *abstract* name is a name which stands for an attribute of a thing. Thus, *horse*, *Bucephalus*, are both *concrete* names;

for *horse* is a name for many things, *Bucephalus* for one thing. Also, *swift* is a concrete name: but *swiftness* is not the name of a thing; it is the name of an attribute of a thing, or an *abstract* name: so are *selfishness*, *poverty*, *health*, &c. They are respectively the condition of being *selfish*, *poor*, *healthy*, &c.. and can have no independent existence, except in a figurative sense.

Since the division of names into *general* and *individual* was complete, and the division into *concrete* and *abstract* is complete also, we must enquire how these classes are relatively situated. It is evident that *concrete* names are sometimes *general* and sometimes *individual*. Thus, *dog*, *happy*, *flower*, &c. are all *concrete*, being the names of things, and *general*, being each of them the names of many things. Again, *William*, *Paris*, *this rose*, are *concrete* and *individual*. Similarly, *abstract* names are sometimes *general* and sometimes *individual*. Thus, *heat* is an *abstract* name; but it contains many degrees of heat, such as *summer-heat*, *blood-heat*, *red-heat*, &c.; therefore it is *general*: while *summer-heat*, &c. are also *abstract*, but are *individual*, there being only one exact degree of heat to which each of these names

can be applied. The members of these two divisions, therefore, mutually traverse.

The next general division of names is into *substantive* and *adjective*.

A *substantive* name is the name of anything that has a real or figurative independent existence, as *John*, *dog*, *whiteness*, *Pegasus*; and an *adjective* name is the name of a quality, or an applied attribute of a *substantive*, as *old*, *great*, *many-worded*. This great division of names, though in universal use in grammar, has been singularly neglected in Logic; yet it is of all the divisions of names the most strictly logical, and in Logic the most important. It is often treated of in works on Logic, not in its proper place, but in the discussion of the real nature of *substance* or *body*, and *attribute* or *quality*, in its most extended meaning; a question wholly extra-logical, and belonging to the science of Metaphysics, but which has been very generally imported into the study of Logic.

For the term *adjective*, the term *attributive* might be advantageously substituted, as it expresses at once clearly the kind of name to which it is applied.

The infinitive case of a verb is a *substantive* name, thus, *to love his neighbour as himself is the duty of a Christian*; but the participle is an adjective, as, *we are gaining the victory*. Care must, however, be taken to distinguish between the present participle and the infinitive in 'ing;' thus in, *gaining the victory is the best proof of a good general*, *gaining* is an infinitive, for the sentence is the same if we say, *to gain the victory is the best proof of a good general*. *Abstract* names, as *goodness*, *friendship*, also *general* names, as *man* in the sense of mankind, &c., are *substantive* names, whether we consider them to have a real or a nominal existence. *Substantive* names may be *general* or *individual*, *concrete* or *abstract*. *Adjective* names are always *general* and *concrete*.

Another division of names is into *connotative* and *non-connotative*.

'This,' says Mr. Mill,* 'is one of the most important distinctions which we shall have occasion to point out, and one of those which go deepest into the nature of language. A *non-connotative* term is one which denotes a

* Logic, B. I. cap. ii. § 5.

subject only, or an attribute only. A connotative term is one which denotes a subject, and implies an attribute. By a subject is here meant anything which possesses attributes.' It is evident, therefore, that *non-connotative* names must be *substantive*, and that they must be either *individual* or *abstract* names. *Connotative* names, in the same way, must be *general* names. Of the former, *James*, *France*, *whiteness*, *friendship*, are examples. These denote the individuals only whom they represent, but they imply no quality or attribute of those individuals. The mere name *James* does not imply that this individual is a man, for the name may be given to any other animal; there might be a *France* in America or Australia, as there is a *London* in almost every English colony; and *whiteness* gives no idea of the intensity of the whiteness alluded to. Of the latter, *horse*, *strong*, *heavy*, are instances. They each denote a number of objects, all of which have certain attributes which they *connote*. Thus *horse* denotes a number of animals, of each of which it connotes that they are mammals, quadrupeds,

solid-hoofed, &c. &c. *Strong* and *heavy* denote all things that are strong or heavy, and connote to each individual to which they apply the attribute of strength or weight.

With regard to *individual* names, it is not correct to say that they are *always non-connotative*. Individual names expressing a relation or attribute peculiar only to the individual, necessarily connote that relation or attribute ; such as *Alexander the Great*, *The last of the Barons*, *The Mother of the Gracchi*. Besides these, other individual names are not *always non-connotative*. Mr. Mill says :* ‘ The only names of objects which connote nothing are proper names ; and these have, strictly speaking, no signification. If, like the robber in the “ Arabian Nights,” we make a mark with chalk upon a house to enable us to know it again, the mark has a purpose, but it has not properly any meaning. The chalk does not declare anything about the house ; it does not mean, This is such a person’s house, or, This is a house which contains booty. The object of making the mark is merely distinction. I say to myself, All these houses are so nearly

* Logic, B. I. cap. ii. § 5.

alike, that if I lose sight of them I shall not be able to distinguish that which I am now looking at from any of the others; I must, therefore, contrive to make the appearance of this one house unlike that of the others, that I may hereafter know when I see the mark—not, indeed, any attribute of the house, but simply that it is the same house which I am now looking at. Morgiana chalked all the other houses in a similar manner, and defeated the scheme;—how? simply by obliterating the difference between that house and the others. The chalk was still there, but it no longer served the purpose of a distinctive mark.’

This example proves exactly the opposite of what Mr. Mill lays down. The robber did not mark the house for future identification, as a police official numbers the houses in a new street; on the contrary, when he marked it his concept of it was, that it was *the* house *where the cobbler had sewn together the four quarters of a man*, and to him that attribute of the house was connoted by the mark. The mark was a stenographic sign or cypher for that many-worded name. To other passers-by the mark connoted nothing, even if they

observed it; but to Morgiana, under the circumstances, it suggested the probability that the house was discovered, and she marked the other houses similarly, and so destroyed the *connotative* value of the mark, and rendered the identification of the house by that means impossible. Had the robber written on the house, ‘This is the house where the cobbler sewed the four quarters of a man together,’ and had she copied the sentence on the other houses in fac-simile, the effect would have been the same, he would have been equally deceived; only Morgiana, and all other passers-by, who could read, would have had the same attribute of the house connoted by the writing that the robber had, differing in this respect from the first case, where the idea was conveyed in a language known only to himself. No matter of what sort the mark was, it stood to *denote* the *house*, and to *connote* its *attribute* in the mind of him who employed it, and it could only denote the house in his mind by connoting this particular attribute of it.

According to Mr. Mill, if a person had mentioned to him, only by name, two indi-

viduals, one a distinguished celebrity, the other ordinary and unknown, until he had some further information, his ideas of both would be identical. The name would never give him the information that George Canning was the distinguished statesman, or that John Jones was the parish clerk. Let us take another case : A witness is called at a trial ; the crier summons, 'Ralph Jenkins!' and the latter steps into the witness-box. Now, when the crier says 'Ralph Jenkins,' a person in court who had never seen or heard of the said 'Ralph Jenkins' before would have no attribute of him connoted by the name, but he would never hear that name again, whether the aforesaid Jenkins appeared or not, without the connotation of this attribute, that he was called as a witness in such and such a case. And, if Jenkins appeared, he would also have all the attributes of his personal appearance connoted by the name. If, further, Jenkins were examined as a witness, his name would always connote to the person who heard his examination such additional attributes as, that he is twenty-nine years of age, that he is a grocer, and that he is next-door neighbour of

the prosecutor ; that he saw the assault committed, and can identify the prisoner in the dock. When, afterwards, the Counsel in addressing the jury, or the Judge in summing up, mentions the name of Ralph Jenkins, is that name as non-connotative as when first it was called by the crier ? Does it not to all who heard the evidence connote his age, his employment, where he lives, and what he knows of the matter, as much as the name *man* applied to him connotes his mortality, his fallibility, &c. ?

It is only *when first heard* that a proper name is *non-connotative* ; or, *if it at any time be forgotten, when first it is heard again*. At every hearing, or remembrance, after the first hearing, it will, at least, *connote* that the individual denoted was heard of before, which is an attribute. A *general* name heard for the first time is as *non-connotative* as an individual name ; indeed, *general* names have nearly all been originally individual names, of which the *denotation* has been increased by experience, and the *connotation* decreased. The difference between the connotation of an *individual* and a *general* name is this : the former connotes to

the minds of a comparatively limited number of persons, who are acquainted with it, certain attributes of the single individual whom it denotes; the latter connotes to the minds of a much greater number of persons, who are acquainted with it, certain attributes of the class, consisting of, it may be, many other classes, or many individuals, that compose it. In neither case is it necessary, indeed it is scarcely possible, that a name should connote exactly the same attributes to any two minds, as it will only connote to each mind the attributes that were known to it individually. Thus, *man* connotes different attributes to the *peasant*, to the *man of ordinary education*, and to the *comparative anatomist*; and *Julius Cæsar* differs much as a concept in the minds of the *schoolboy* who has just commenced the study of his *Commentaries*, of the *student of the Philosophy of History*, and of the *actor* who is about to 'go on' in the character.

✓ *Abstract names alone are always non-connotative.*

Names are again divided into *Positive*, *Privative*, and *Negative*. This is a division which holds, not with regard to the names

themselves, but to their application—a name, or the concept* for which it stands as a mark, cannot, when viewed objectively or subjectively, to the mind of the thinker, be *Privative* or *Negative*; it can only be so when viewed in relation to some other name or concept, of which it denotes the absence or negation.

A *Positive* name is a *Substantive* or *Adjective* name, expressing a real existence or a real quality, as *body*, *thing*, *lively*, *thoughtful*.

A *Privative* name is an *Adjective* name, expressing the non-existence of an attribute in an object *where it must exist*; as, *lifeless* applied to *manner*; *thoughtless* applied to a *man*; *hopeless* applied to *the case of an invalid*.

A *Negative* name is an *Adjective* name, expressing the non-existence of an attribute in an object *where it could not exist*; as, *lifeless* applied to a *corpse*; *thoughtless* applied to *the wind*; *hopeless* applied to *the abyss of hell*.

Some writers include among *Negative* names, *Substantive* names which express the

* *Concept* is the result of *conception*, which is the act of comprehending or grasping up into unity the various qualities by which an object is characterised.—Sir W. Hamilton's Lect. on Log. Vol. I. p. 120.

non-existence of an object; as, *nothing*, *nobody*. But such names do not stand for concepts of objects which could be called *Negative concepts*, or concepts of *Negative objects*; but for concepts of *facts*, which in themselves *Positive*, are stated in a *Negative form*, and of which the *concepts* are *Positive*. Thus, *nobody* does not express any object or existence, but only the *fact* of the absence of any existence denoted by the name *body*; and the same with *nothing*, &c. We have therefore confined the class of *Negative* names entirely to *Adjective* names, where the mistake is not so likely to arise as in the case of *Substantives*.

But even then it may occur, as for instance: Sir William Hamilton divides thought into two kinds, Positive and Negative. 'We have,' he says,* 'a positive concept of a thing when we think it by the qualities of which it is the complement.'—Granted; *our concept of a thing is the thought of what is to us the connotation of its name*.—'But,' he proceeds, 'as the attribution of qualities is an affirmation, as affirmation and negation are relatives, and as relatives are known only in and through each other, we cannot, therefore, have a conscious-

* Lectures on Logic, Vol. I. p. 102.

ness of the affirmation of any quality, without having at the same time the correlative consciousness of its negation. Now, the one consciousness is a positive, the other consciousness is a negative notion. But in point of fact, a negative notion is only the negation of a notion ; we think only by the attribution of certain qualities, and the negation of these qualities and of this attribution is simply in so far a denial of our thinking at all. As affirmation always suggests negation, *every* positive notion must likewise suggest a negative notion. And as language is the reflex of thought, the positive and negative notions are expressed by positive and negative names.' —Therefore our notion of 'a horse' suggests 'a denial of our thinking at all,' and *every* positive notion suggests a *negative* notion, which will thus have a negative name.—What is the name of the negative notion of 'a horse?'—'Thus,' he continues, 'it is with the infinite. The finite is the only object of real or positive thought ; it is that alone which we think by the attribution of determinate characters : the infinite, on the contrary, is conceived only by the thinking away of every character by which

the finite was conceived ; in other words, we conceive it only as inconceivable. This relation of the infinite to the finite is shown, indeed, in the terms by which it is expressed in every language. Thus, in Latin *infinitum* ; in Greek, *ἄπειρον* ; in German, *unendlich* ; in all of which original tongues the word expressive of the infinite is only a negative expression of the finite or limited. Thus the very objection from the existence of a name and notion of the infinite, when analysed, only proves that the infinite is no object of thought ; that we conceive it not in itself, but only in correlation and contrast to the finite.'

Now, to form a concept, we must have an object in which the qualities inhere, and if we form a positive concept, and therefore must have a negative concept to correspond, what is the object of which the qualities of the positive concept are denied ? Has it no qualities, but the negation of qualities only ? If it has any other, our concept of it must be a positive concept. If we form the concept of 'a wise man,' and then of 'an ignorant man,' is the latter a negative concept in any sense *except as viewed in relation to the previous concept* ? So

in forming the concept of 'limited space,' and then the concept of 'unlimited space,' the second is as positive a concept, viewed subjectively to the mind of the thinker, as the first. Negative Concepts, which were negative to the thinker, would take rank thus:—1. Positive Concepts; 2. The Concept of Nothing; 3. Negative Concepts: these last would be concepts of objects worse than nothing! The doctrine of concepts, which would be negative when viewed subjectively to the mind of the thinker, is simply absurd, and had it not been latterly called much into notice by some extremely fallacious though most ingenious reasoning that has been to a great extent founded on it, it would not have merited notice.

Our concepts are *clear and distinct* in different degrees. When we can *define* with precision the object of which we form the concept, the latter is *clear*; when we *divide* the object adequately, the concept of it is *distinct*. We can *define* any infinite* object, and can form

* 'The Infinite' is an *abstract name*, and it is thoroughly illogical to use it as synonymous with 'God,' and a source of a fearful amount of fallacy, on the most important and highest of all subjects.

a clear positive concept of it; but we cannot divide it adequately, as its parts are innumerable; and if we divide it by a dichotomy, one or both of the members must be infinite; therefore *our concept cannot be distinct*. This fact we render in ordinary phraseology by saying that *we cannot comprehend the infinite*.

As to the argument from the name *Infinite*, surely so accomplished a linguist as Sir William Hamilton could have remembered other names which have *negative forms* in three original languages.

Another division of names is into *relative* and *non-relative*.

Every substantive name which, in the existence of the object it stands for, implies the necessity of another existence, and every *adjective* name which expresses an attribute, the possession of which by an object implies necessarily the existence of another object possessing another attribute which affirms the same relation, or set of facts, in another point of view, is a *relative* name. The object whose existence is necessarily implied is, considered subjectively to the other, the *correlative* of the relative; thus, *parent* implies *child*, *master*

implies *servant*, *king* implies *subject*; and these names taken in pairs are *correlatives*. All comparative *adjective* names, and such as express *likeness*, *unlikeness*, *equality*, or *inequality*, are *relative*; for *better* implies *worse*; *equally good*, something that is *as good*, &c. Only in these cases it is not the *object*, whose existence is necessarily implied, but *the attribute* which it possesses, that is the *correlative*.

The last division of names that we shall mention is into *Univocal*, *Analogous*, and *Equivocal*.

‘A word the same in form and sound, if it be predicated of several subjects in the same sense, i. e. to express the same collection of qualities, is *Univocal*; if in different senses, i. e. to express different collections of qualities, and these connected, is *Analogous*; if unconnected, *Equivocal*: e.g. *man* is predicated; of *John* and *Thomas*, *univocally*; of *Thomas* and *his picture*, *analogously*; of *an island* and *Thomas*, *equivocally*.’*

* Munro's Manual of Logic, p. 20.

CHAPTER II.

OF NAMES, TERMS, OR CONCEPTS—THEIR EXTENSION, COMPREHENSION, AND RELATION.

WE shall now consider Names as employed in enunciation, speech, or predication, which is that use of words of which alone Logic is cognizant. With other forms of speech, such as exclamations of surprise, anger, &c., and prayers, wishes, commands, interrogations, and the like, Logic has nothing whatever to do.

(*Enunciative speech* consists solely of propositions, or complete enunciations of reasoning thought, in which one or more names are affirmed or denied of one or more other names: thus, *men are mortal*; *men are not infallible*; *iron is heavy, hard, and subject to oxidation* ; *mercury is not light, vegetable, nor solid at ordinary temperatures*; *firs, oaks, ashes,*

and elms are forest trees ; dogs, cats, horses, sheep, and goats, are not birds ; Italians, French, Dutch, and Germans are nations dwelling on the continent of Europe, Christians, civilized, and governed by monarchs ; Whigs, Tories, and Conservatives, are not ruminants, quadrupeds, nor amphibious. (The name affirmed or denied is called the *predicate* ; the name of which it is affirmed or denied is called the *subject*. Properly speaking, in every proposition there is only one subject and one predicate. When there are more of either, the proposition is said to be compound ; but, logically considered, it is several propositions grammatically combined in one. Thus, the compound proposition, *Iron is heavy, hard, and subject to oxidation*, is nothing more than the shortened grammatical representation of the three simple propositions, *Iron is heavy, Iron is hard, Iron is subject to oxidation* ; and the compound proposition, *John and James are good and true*, is similarly the same abbreviation of the four simple propositions, *John is good, John is true, James is good, James is true*.

(There is something necessary, however, in

a proposition besides the *subject* and *predicate*, viz. the *copula*, that by which the latter is affirmed or denied of the former. The *copula* in the propositions which we have given above appears in its simplest form, i. e., 'is' or 'are' in affirmative propositions, and 'is not' or 'are not' in negative, and so far this is sufficient for our purpose.

But there are only certain words which can be used alone as the *subject* or *predicate* of a proposition, and a little consideration will show that these must always express either objects of thought or their attributes; or, in other words, that they must be *names*. (No words that are not *names* can stand *alone* as the subject or predicate of a proposition. Thus, we cannot say, *A tree is very*,) or *a very*; *A much is called Ulysses*; but *much* or *very* can form part of a many-worded name, and so stand as part of the subject or predicate; thus we can say, *A tree is very green*; *A much-enduring man is called Ulysses*. Such words are called *syncategorematic words*, or *syncategorems*—from συν, together, and κατηγορέω, I predicate—because they cannot be predicated excepting together

with some other word or words. Similarly, *names* are called *categorematic words*, or *categorems*, because they can be predicated independently of any other word.

Some logicians would exclude *adjective* names from the class of *categorems*, and reduce the latter to *substantive* names only. They say that properly, when an *adjective* is *subject* or *predicate* of a sentence, a *substantive* is necessarily understood. Thus, in '*John is good*, we understand the word *man*, or *individual*, or the like ; and the real proposition is, *John is a good man*. In *The mighty are fallen*, we understand in the same way *men*, or *people* ; and the proposition is, *The mighty men are fallen*. As a proof of this, they say that an *adjective* cannot stand as subject of a proposition unless accompanied by the definite article, and in the plural number. Thus, we cannot say, *Strong rent an oak*, or, *A strong rent an oak*, but we must supply the word *man*, and say, *a strong man rent an oak*. We agree with Mr. Mill when he says, 'this distinction, however, is rather grammatical than logical ;'* and we shall include *adjective* names in the

* Logic, B. I. cap. ii. § 2.

class of *categorems*. In many languages the question could not arise, as in Latin we have :—

*Integer vitæ, scelerisque purus,
Non eget Mauri jaculis, neque arcu,
Nec venenatis gravidâ sagittis,
. . . . pbaretrâ.*

Frequently the *copula* and *predicate* are involved, or stated implicitly in one word; as in the propositions, *man works, woman weeps, Cæsar conquered the Gauls*. In the two first the *predicate* is the present participle of the verb, which is an *adjective* name, and is, together with the *copula*, expressed by the third person singular of the present tense of the indicative mood; and the propositions, when explicitly stated, are, *man is working, woman is weeping*. In the third, part of the *predicate* and the *copula* form the third person singular of the preterite tense of the verb from which the *predicate* is immediately derived, and the explicit proposition is, *Cæsar was the conqueror of the Gauls*. In every case the tense of the verb in which the *predicate* and *copula* are implicit is the same as that of the *copula* explicitly stated.

We have said that the infinitive of a verb is a *substantive* name; still it can only stand as the *predicate* of a proposition when another infinitive is the *subject*; as, *To be contented is to be happy*. In such a proposition as, *One aid to health is to rise early*, the predicate comes first; and if the proposition be inverted, the sense is in no way changed or affected, *To rise early is an aid to health*, being precisely the same proposition; and in it, *an aid to health* is predicated of *To rise early*. The subject and predicate of a proposition being *Names*, we might continue still to call them by that appellation; but *Names*, when thus related to one another in a proposition, are more generally called *Terms*. Sir William Hamilton, viewing them subjectively to thought, calls them *Concepts*, or the results of the mental faculty of *conception*. We shall use all these appellations, calling them *Names*, when considering them subjectively to the things for which they stand, or which they denote; *Concepts*, when considering them subjectively to the mind of the thinker, or as objects of thought; *Terms*, when considering them relatively as *subject*

and *predicate*, or as members of a proposition. As *Names* and *Terms*, they may be viewed as the *instruments*; as Concepts they may be viewed as the *materials* of Logic.

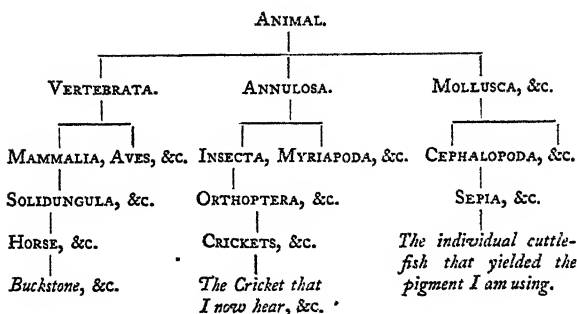
There is one class of Terms, viz. *general* Terms, which are elaborated by the mind from the concepts of individuals in a peculiar manner. The mind views, for example, numerous individual *horses*; in the individual concept of each separate *horse* it attends separately to each of the attributes which, taken together, form the concept; and, at the same time, by giving this separate and undivided attention, it *abstracts* the concepts of these individual attributes. It is by this mental faculty of abstraction that *abstract* concepts are formed; such as *whiteness*, *virtue*, *fortitude*. Thus, it notes separately that the *horse* is four-footed, has a certain external form, a certain shape and position of head, ears, eyes, &c., that it has a mane and tail with long hair, a certain colour; and so on. Afterwards, by another of its powers called *generalization*, it collects all the *common* qualities in these different abstractions, and out of them forms the *general* concept of

horse. This general concept only wants the addition of the peculiar qualities of any individual horse to make it the *individual* concept of that horse. It may differ much in different minds, according to the number of the qualities common to every *horse*, which have been observed ; yet it serves to all as a common mark for the whole number of individuals constituting the class. The use of these *general* or *universal* terms is more frequent than of *individual* terms. Reid says:—‘In all the fifteen books of Euclid’s *Elements*, there is not one word that is not general; and the same may be said of many large volumes.’*

But all general concepts are not *equally* general ; thus, *horse, cow, pig, dog, cat, &c.*, are all general concepts ; but another general concept, MAMMALIA, includes them all, as another general term, VERTEBRATA, includes not only *it*, but *birds, reptiles, and fishes* as well ; while VERTEBRATA is included with others in the concept ANIMAL, and so on. We have thus, then, a principle on which to classify concepts with regard to their generality.

The terms *genus*, *species*, *individual*, include all *substantive general* concepts.

When all concepts of which the general concept in question can be affirmed are *individual* concepts, then the general term is a *species*; when the concepts are not *individual*, but themselves *general*, then the concept in question is a *genus*; and those concepts of which it can be affirmed are its *species*. The *genus* itself may be one of a number of concepts, of all of which another *general* concept may be affirmed; and then the former is viewed *in relation to the latter as a species*, of which the latter is the *proximum genus*. A *species* which contains individuals only is called a *species infima*, *species specialissima*, or *species proper*; and in any particular classification, that *genus* which is contained in no other is called the *summun genus*. These are the extremes of *species* and *genus*—the extremes of the *classification* being *summun genus*, and *individual*: of the classes between them any one is a *genus subalternum* relatively to the classes which it contains, and a *species subalterna* relatively to the class which contains it. Thus, in the classification of the animal kingdom, we have :—



Taking what is called a *predicamental line* through Vertebrata, we have, in one series,

ANIMAL.	<i>Summum genus.</i>
MAMMALIA.	{ <i>Species subalterna.</i>
	{ <i>Genus subalternum.</i>
SOLIDUNGULA.	{ <i>Species subalterna.</i>
	{ <i>Genus subalternum.</i>
HORSE.	<i>Species infima.</i>
Buckstone.	<i>Individual.</i>

MAMMALIA and SOLIDUNGULA having the relation pointed above the line to the classes above them, and that below the line to the classes below them. Thus all classes between the *summum genus* and the *individual* have in the same system of classification two different relations.

These words, then, *genus*, *species*, *individual*, include all *general substantive* concepts.

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We have now to class the *adjective* concepts, which are all *general*. To do this we must consider the *connotation* of the terms we have just examined. A *genus* denotes all the *species* it contains, but it only *connotes* the attributes common to them all; each of these species *connotes* all these attributes, and some attribute or attributes besides. It is among these last that the attribute must be sought for which forms the specific difference between it and the other *species* which are contained with it in the *proximum genus*—the attribute which belonging to that species belongs to none of the others:—this attribute is its *differentia*. Should there be more than one such attribute, they will be all *differentiæ*, for it is clear that it might have been distinguished by any of them. Every other attribute of a *species* is a *proprium*, it may belong to many or to all the *species* contained in the *proximum genus*, but must belong to more than one. It is easily seen that in the ascending scale a *proprium* may or may not become a *differentia*, but every *differentia* in the descending scale becomes a *proprium*. Thus, *horses*, *asses*, &c., are all *organized*, *vertebrate*, and *solid-hoofed*: these are *propria*

of all the *species*, *horse*, *ass*, &c.; but, ascending one step, and considering the *proximum* genus, SOLIDUNGULA, as a *species subalterna* of VERTEBRATA, *solid-hoofed* becomes its *differentia*, while *organized* and *vertebrate* remain *propria*. Ascending another step, the latter becomes a *differentia*, while *organized* remains still a *proprium* of VERTEBRATA, ANNULOSA, &c., and at last an attribute of the *sumмум genus*, ANIMAL.

Again, the *species infima* denotes all the individuals which compose it, and *connotes* all the attributes common to them. The name of each individual connotes all these attributes, each of which is a *proprium* of the individual, and certain others which are *accidentia*. An *accidens* may be common to several individuals, and those individuals might be classed by it, and the *species infima* cease to be *infima* and become a *subalterna*: thus *horse* might be divided into *bay horses*, *brown horses*, &c., or into *long-legged horses*, and *short-legged horses*, there being a standard length below which the leg was *short*; but such subdivisions may be rejected, either because they are fanciful, not denoting, as we know by experience, any real

difference in kind, as the progeny of a grey horse may be bay, or of a short-legged horse longer or shorter legged than the sire or dam; or because, although they may be subdivisions good in themselves, they are not suitable parts of the classification that is being made: thus, the division of *horse* into *blood-horse*, *draught-horse*, &c., is good as a classification in a work on *Horses*, where *HORSE* is the *summum genus*, but not good in the classification we have considered, which is for a general work on Natural History. It is clear, however, that an attribute of a *horse* which might be a *proprium*, or a *differentia*, in the former classification, would only be an *accidens* in the latter.

To give an instance of *proprium* and *accidens* in an individual: *Buckstone* is *organized*, *vertebrate*, *solid-hoofed*, &c.: these are *propria*; but he is also a *racehorse*, *bay*, &c., and these are *accidentia*, relatively to our classification.

To one of these six classes, *genus*, *species*, *individual*, *differentia*, *proprium*, and *accidens*, every known concept must belong. Of the three first there is this to be said, that in any classification the higher the order of the class

the *more* it *denotes* and the *less* it *connotes*; the *summmum genus* denoting the *maximum* in that *classification*, i. e. all the individuals classified; and *connoting* the *minimum*, i. e. having fewer attributes than any other class; while the individual denotes the *minimum*, i. e. unity; and connotes the *maximum*, i. e. all the *propria* and its own *accidentia*. Were we to follow Mr. Mill's *dictum* on individual non-connotation, we should say that the *species infima* connotes the *maximum*; the individual connoting *nothing*.

This difference of denotation and connotation is commonly called the *extension* and *comprehension* of a term. It is easy to show in a tabulated form this variation, thus:—

	Extends to,	Comprehends,
ANIMAL,	All organized sensitive bodies, i. e. all BRUTES and MEN that have ever been or ever will be created.	Body, organization, sensation.
MAMMALIA,	All organized sensitive bodies that suckle their young, i. e. all QUADRUMANA, CARNARIA, &c., and MEN that ever have been or will be created.	Body, organization, sensation, specific property of suckling the young.

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BIMANA,	All MEN that ever have been or will be created.	Body, organization, sensation, specific property of suckling the young, having two and only two hands, reason, walking erect, &c. &c.
JAMES,	One MAN.	Body, organization, sensation, specific property of suckling the young, having two and only two hands, reason, walking erect, an Englishman, a Christian, red-haired, six feet high, a Dissenter, called Nokes, &c., &c.

It is manifest from what we have just said that if two individuals of the same species have identically the same *accidentia* they would be the same individual, or, no two individuals of a species can have identically the same *accidentia*. Similarly, no two species of the same *proximum genus* can have the same *differentia*.

Again, the five, *genus*, *species*, *differentia*, *proprium*, and *accidens*, are called the five *predicables*, since every predicate in any pro-

position can be referred to one of them. As an *individual* cannot be predicated of anything but itself, *individual* is excluded from the predicables. *This man is John*, is an identical proposition, which has distinctively neither subject nor predicate, either *this man* or *John* being the one or the other without affecting the meaning.

We may now consider two Logical Processes—*Definition* and *Division*.

Definition is properly the description of any concept with a view to the clearness of its conception. Evidently, therefore, the most complete definition of a concept is a perfect enumeration of its attributes; thus, we define the class VERTEBRATA to be, *material, organized, sentient beings, having a spinal column, a sanguineous circulation, reproductive organs, &c.* But such a definition is practically too long, and we have a ready means of shortening it. The *proximum genus*, as we have seen, connotes all attributes of the *species subalterna*, except the *differentia* and perhaps some *propria*: adding, then, to the concept of the *proximum genus* the *differentia* of the *species* we wish to define, we have a clear limi-

tation of the denotation of that species, though not a complete enunciation of its connotation, for the concept of the *genus* and the concept of the *differentia* may not together include all the *propria* which the concept of the *species* connotes. Thus, we can define VERTEBRATA to be, ANIMALS *having a spinal column*; this definition gives a clear concept of them as distinct from all other beings, but it does not give a full description of them, such *propria* as, *having a sanguineous circulation, and reproductive organs*, being omitted from the concept. Such a definition is called a *logical* definition. It is inapplicable to an individual, who can only be described, for even if the *species infima* and one or more of the *accidentia* of the individual be given, it may not be sufficient to distinguish it, as another individual of the same species may possibly have all the possible *accidentia* but one, while a third may have that *accidens* and all the others except one, and so on. Therefore, generally speaking, an individual must be described by giving the species to which it belongs and *all its accidentia*. It is, however, sometimes the case that an *accidens* of an individual is of such a nature that

it was impossible that it could be predicated of any other individual. Thus, *George the Third was King of England when the battle of Waterloo was fought; Abraham Lincoln was President of the United States when the Union was broken up.* In such cases the term *definition* must be allowed, as the enunciation is not full enough for a *description*.

A *summum genus* does not admit of logical definition. This is true of every *summum genus* in any system of classification, though that very *concept* may in another classification be a *genus subalternum*, and therefore definable as a *species subalterna*. The one *summum genus*, which is never a *subalternum*, and therefore always incapable of definition, is *Being* or *Existence*, the concept of which has the *absolute minimum* of comprehension.

Reid says,* ‘ There are also many species of things, whose specific difference cannot be expressed in language, even when it is evident to sense, or to the understanding. Thus *green*, *red*, and *blue* are very distinct species of colours; but who can express in words wherein

* Account of Aristotle’s Logic, cap. ii. § 5.

green differs from red and blue?’ In a note to this, Sir William Hamilton says: ‘Hence it was expressly stated by the old logicians, “*omnis intuitiva notitia est definitio*.”’ Intuitive concepts cannot be defined.

The rules of definition are three, viz. :—

1. The definition must be adequate ; that is, the *genus* predicated must be the *proximum genus* in some system of classification, and the *differentia* predicated must be a true *differentia* in the same system.

When a definition is adequate it will reciprocate,—or be true when simply converted,—thus, SOLIDUNGULA are MAMMALIA *having solid hoofs*, and, *all MAMMALIA having solid hoofs are SOLIDUNGULA*, are equally true.

2. The definition must be in itself plainer than the concept defined ; that is, the concept of the *proximum genus*, and of the *differentia*, must be themselves clear.

3. The definition must be included in a just number of proper words ; that is, the *names*, whether single or many-worded, of the *proximum genus* and *differentia*, must be *univocal*.

Definition is the declaration of a concept or

name according to its *comprehension* or *connotation*.

Division is the declaration of a concept or name according to its *extension* or *denotation*.

Therefore an *individual* does not admit of logical division.

A *genus* is logically divided when all the proximate *species* are enumerated. Thus SOLIDUNGULA is logically divided into *horse*, *ass*, *quagga*, *zebra*.

The rules of Logical Division are three:—

1. The parts, i. e. the constituent *species*, must be together equal to the *genus* divided; that is, equal in extension or denotation, for each part must necessarily comprehend more than the original whole. A division which violates this rule will be inadequate, erring either by excess or by defect.

2. The constituent species must exclude one another; that is, the *species* must be correctly separated according to true *differentiæ*, it being borne in mind that a *differentia* is a quality which only belongs to one *species* of the same *genus*, in the same system of classification. A division which violates this rule is called a *cross-division*.

3. The division must proceed on one principle of classification. This rule should have been the first, as an infringement of this will produce an infringement of one or both of the others; but this rule may be observed and the first be infringed. If, however, this rule be infringed, the second must also be infringed.

A division, therefore, which does not proceed on one system of classification may be *both inadequate and cross*; but a division may be *inadequate* without being *cross*, provided the error be in *defect*, being the result of omission. A division which is faulty by *excess* must be *cross*. A *cross* division may still be *inadequate* by *defect*.

The second and third rules are identical, for taking a *proprium* for a *differentia* is virtually altering the principle of classification.

§ Besides *Logical Division*, *Physical Division* is recognised. It is the division of a *physical whole* into its parts, as that of a *horse* into its *legs, head, body, tail, &c.*, and is the only division of which an individual is susceptible.

But there is a further system of division strictly *Logical*, as obeying all the three rules given above: it is the division of a whole

into only two members, one of which is contradictory of the other: thus, ANIMAL may be divided into VERTEBRATA and NON-VERTEBRATA; NON-VERTEBRATA into ANNULOSA and NON-ANNULOSA, and so on. Each of these divisions is called a *dichotomy*. Such a system is, as Reid observes, burthensome when carried much into practice; still it may be useful in dividing a whole that is imperfectly known; it is, as we have previously had occasion to say, the only logical division of *the Infinite*.

We must here remark, that definition enables us to form a *clear*, and division a *distinct* concept of the whole defined or divided. These two qualities, *clearness* and *distinctness*, constitute the entire *quality* of a concept; while the two which we have previously considered, *comprehension* and *extension*, constitute its *quantity*.

From what we have said already, we see that concepts must have another attribute besides quantity and quality, viz. *relation*. The concepts in a predicamental line are, as we have seen, contained in one another, and this in two ways, *comprehensively*, or *extensively*. The *summum genus*, *genera subalterna*, and

species infima are all contained comprehensively in the *individual*; while all the *individuals* and *species subalternæ* are contained extensively in the *summun genus*. Again, all the concepts of the species contained in a *genus*, or of the *individuals* in a *species*, have to each other the relation of *coordination* with regard to their extension, and of partial inclusion and partial exclusion as regards their comprehension. *Adjective* concepts may have partial inclusion and partial exclusion as regards their extension, but have complete exclusion as regards their comprehension. Complete exclusion, both in comprehension and extension, may apply to *substantive* or *adjective* concepts.

As examples—I. The Concepts of ANIMAL, VERTEBRATA, MAMMALIA, BIMANA, and MAN are all contained in the comprehension of *John Brown*. 2. The Concepts of all individual men and living organised beings; of all their *species infimæ*, MAN, HORSE, ADDER, ACTINIA, &c. &c.; of all the *genera* coordinate with BIMANA, and with MAMMALIA, &c. &c., are contained in the Concept of ANIMAL with regard to its extension. This relation is called *subordination*;

it is the relation which individuals have to the *species infima*, and *species subalternæ* to the *genus proximum*. 3. All the *species VERTEBRATA*, *ANNULOSA*, &c. &c. are coordinate in extension, as alike *species subalternæ* of the *proximum genus*, *ANIMAL*, but in comprehension they partly include and partly exclude one another; such *propria* as *organisation*, *sensation*, &c. being common, while the *differentiæ* are only predicable of them separately. 4. Such Concepts as *hard*, *green*, may apply to many things in common; while the majority of things, it may be, which possess the one do not possess the other: but *hard* and *green* never connote the same attribute. It may be said that such concepts as *dark-green* and *pea-green* connote the same attribute, *greenness*, but they do not connote the *same* greenness: adjectives which connote the same thing must be identical. 5. The Concept *star* completely excludes the concept *animal*; the concept *spiritual* excludes completely the concept *heavy*.

There is another relation of concepts called *Identity*; but, as Sir William Hamilton observes,* such a relation can never exist in

comprehension ; for, were two concepts absolutely identical, the mind could never conceive of them as two concepts, but only as one. The nearest approach to identity is *reciprocity*. Concepts are reciprocal when they are identical in *extension*, or *coextensive*, as *living* and *organised*, there being nothing of which the one may be predicated and not the other.

There are several symbolical ways of representing the relations of concepts : the best is probably that of Euler, or at least generally ascribed to him. It is by means of circles, and applies to *extension* only, or *comprehension* only, as may be indicated. We shall give one or two examples of it.

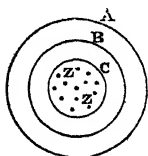


FIG. 1.

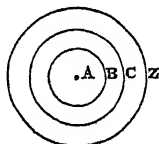


FIG. 2.

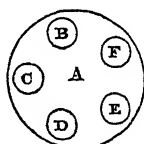


FIG. 3.

Fig. 1 represents a predicamental line in extension :

- A. The *summum genus*.
- B. A *genus subalternum*.
- C. The *species infima*.
- Z, Z, &c. Individuals.

Fig. 2 represents the same in *comprehension*, the same letters being used.

Fig. 3 represents a *genus* and its coordinate *species subalternæ* in extension : A being the *genus* ; B, C, D, &c., the coordinate species.

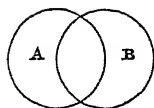


FIG. 4.



FIG. 5.

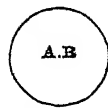


FIG. 6.

Fig. 4 represents partial inclusion and partial exclusion.

Fig. 5 represents total exclusion.

Fig. 6 represents identity in extension, or comprehension.

Such a system of symbols is of no practical utility, and nothing can be done by means of it. We cannot by it symbolise concepts, and thus find their relation : we must first know the relation, and then symbolise *it*.

It is impossible to symbolise by circles the relations of coordinate concepts in comprehension.

Another subject usually treated of in this part of Logic is the classification of concepts according to their *real* nature ; but this is properly a metaphysical question, so we shall only note the heads of the Aristotelian system of *categories* or *predicaments*, as they are called, and of the systems proposed by Sir William Hamilton and Dr. Thomson.

According to Aristotle, all things that are

In this the attempt to give an adequate division of *Relation* is not an improvement on the original.

It was a usual task for the wits of a student to comprehend all the Aristotelian categories in a distich or stanza. We give two, as examples :—

Arbor, sex servos, fervore, refrigerat ustos,
Ruri cras stabo, nec tunicatus ero.

A lady stout, too warmly clad,
At Bow, one summer-day,
Walking a mile to see her son,
Was melted quite away.

CHAPTER III.

OF PROPOSITIONS.

AT the commencement of last chapter. we touched slightly upon Propositions, to enable us to understand what is meant by predication, and so to have a clearer insight into the nature of Concepts or Names, which are the terms of a proposition. We shall now return to them for their own sake.

Speaking in general terms, a proposition is an enunciative (or declaratory) sentence, in which one thing is affirmed or denied of something else ; or, a proposition is a sentence which declares the degree in which two Concepts or Names agree or disagree, or their mutual co-inclusion or co-exclusion.

That of which the affirmation or negation is made, is the *subject* of the proposition ; that which is affirmed or denied of it, is the

predicate ; that which expresses the affirmation or denial is the *copula*.

The copula may be expressed *implicitly*, as, *I love*; *Wellington conquered Buonaparte*; or *explicitly*, as, *Man is mortal*. When it is expressed implicitly, it is united to the predicate, or to a part of it: thus, *I love* is equivalent to *I am loving*; where *I* is the subject, *loving* the predicate, and *am* the copula. Similarly, *Wellington conquered Buonaparte* is equivalent to, *Wellington* (subject) *was* (copula) *the conqueror of Buonaparte* (predicate). When the copula is expressed implicitly the proposition is said to be *of the second adjacent*; when explicitly, *of the third adjacent*.

In some languages, as in Latin, a proposition may be expressed in one word, as *sum*, *amo*.

When in a proposition there are more than one subject or predicate, it is called *compound*; as, *Robert and William are men and brethren*: when there is only one subject and one predicate, it is *simple*; as, *Henry is tall*. This is not, however, as we have previously remarked, a logical, but a grammatical distinction; in a compound proposition, several simple propositions are grammatically included in one

without the slightest logical difference in their meaning : thus, the compound proposition, *Robert and William are men and brethren*, is exactly equivalent to the four propositions, *Robert is a man ; William is a man ; Robert is a brother ; William is a brother*.

It is obvious that propositions will vary according to the nature of, 1st, *the subject* ; 2nd, *the copula* ; 3rd, *the predicate*. The 1st determines their *quantity*, the 2nd their *quality*, and the 3rd their *relation*.

Propositions are *universal* or *particular*, according as the *subject* is taken in *the whole* or *part of its extension* ; or, as it is generally called, as it is *distributed* or *undistributed*. In the proposition, *Men are mortal*, the *subject*, *men*, is distributed, or, as it were, every individual man of the race is taken separately and the *predicate* applied to him. But in the proposition, *Some VERTEBRATA are MAMMALIA*, the *subject* is undistributed : only certain members of the class VERTEBRATA are taken, and have the *predicate* applied to them ; the rest are left untouched. As we have seen that an *individual* is logically indivisible, it follows that wherever the *subject* of a proposition is an *individual*

term, the proposition is universal, as the *subject* must be taken in the whole of its extension—the latter being a minimum: thus, *Alexander the Great was a man*, is universal. The *subjects* of particular propositions, therefore, can only be *general* terms taken in part of their extension. It is common to class propositions having an *individual term* for *subject* as *singular* or *individual* propositions; but there is no ground for such a classification, as the question is not how great the extension of the *subject* is, but whether it is taken in the whole of it or not; and in the following part of Logic it has to be abandoned.

Another division of propositions which is not unfrequently given, is into *definite* and *indefinite*; but Sir William Hamilton* explains very clearly that those terms should be changed into *predesignate* and *preindesignate*, or those propositions in which the distribution of the *subject* is verbally expressed; as, *ALL men are mortal*; *SOME savages are cannibals*; and those in which the expression of it is to be found in the matter of the proposition, as, *Men* (i. e. *ALL men*) *are fallible*; *Dogs* (i. e. *SOME dogs*) *go mad*. There is nothing *definite*

* Lect. on Log., Vol. I, p. 244.

or *indefinite* in the implication or explication of the distribution of the subject; the definition or indefinition of the proposition lies in the distribution itself. In every universal proposition, as *Popes are men*, *All horses are quadrupeds*, *John is tall*, the *subject* is definite; *every Pope*, *every horse*, and *the actual individual*, *John*, admit of no uncertainty: but in every *particular* proposition, the *subject* is *indefinite*; for in such propositions as, *Some horses are race-horses*, *Many men are six feet high*, we have no definite idea of *how many* horses are race-horses, nor of *how many* men are six feet high. In treating of this, Sir William Hamilton says,* ‘That individual judgments do not correspond to universal judgments merely in virtue of the oneness of their subject, is shown by this,—that if the individual be rendered indefinite, the judgment at once assumes the character of particularity. For example, the propositions, *A German invented the art of printing*, *An Englishman generalised the law of gravitation*, are to be viewed as particular propositions; but if we substitute for the indefinite expressions, *a*

* Lect. on Log., Vol. I, p. 247.

German and *an Englishman*, the definite expressions *Fust* and *Newton*, the judgment obtains the form of an universal.' The same reasoning, however, will apply to all universal propositions of which the subject is not *Existence* or *Being* (*Ens*), i. e. the absolute *Summum genus*; see p. 46. We can make the subject of the proposition, *All men are fallible*, indefinite, and the proposition a particular proposition, as easily as though that subject were individual. *Some* is only the plural of the indefinite article, as employed here in, *a German*, *an Englishman*; and, *Some animals are fallible*, is as particular and indefinite a proposition as, *A German invented the art of printing*. Therefore, there is nothing in Sir William Hamilton's remark to show that singular propositions are not universal.

As an instance of a cross division, the common classification of propositions, according to quantity, into universal, particular, singular, and indefinite, is a good example.*

As regards their *Quality*, i. e. the property determined by the copula, propositions are

* A different view of the quantity of propositions will be enunciated in treating of the syllogism.

affirmative or *negative*; and these, again, are each divisible into *pure* and *modal*. There are, therefore, four kinds—*simple affirmative*, *simple negative*, *modal affirmative*, and *modal negative*. It is better, however, to consider them as, 1, affirmative or negative; and, 2, pure or modal.

All men are fallible, is a simple affirmative; *Men are not infallible*, is a simple negative; *Men are generally prejudiced*, is a modal affirmative; *Men are not always industrious*, a modal negative.

It has been a disputed point whether all such propositions are not simple and affirmative, in this way. The negative or the modifying particle may be attached to the *predicate*; thus: *Men—are—not-infallible*; *Men—are—generally-prejudiced*; *Men—are—not-always-industrious*. But, in this way, every affirmative proposition might be stated as a negative; for, instead of saying, *A is B*, we might say, *A is not non-B*. Sir William Hamilton gives a good account of the matter. ‘Many,’ he says,* ‘maintain that the negation belongs to the predicate, on the following

* Lect. on Log., Vol. I, p. 252.

grounds :—If the negation belonged to the copula, there could be no synthesis of the two terms ; the whole act of judgment would be subverted ; while, at the same time, a non-connecting copula, a non-copulative, is a contradiction in terms. But a negative predicate—that is, a predicate by which something is taken away or excluded from the subject—involves nothing contradictory ; and, therefore, a judgment with such a predicate is competent.’

‘The opposite doctrine is, however, undoubtedly the more correct. For, if we place the negative in the predicate, negative judgments, as already said, are not different in form from affirmative, being merely affirmations that the object is contained within the sphere of a negative predicate, or that a negative predicate forms one of the attributes of the subject. This, however, the advocates of the opinion in question do not venture to assert. The objection from the apparent contradiction of a non-connecting copula is valid only if the literal, the grammatical, meaning of the term *copula* be coextensive with that which it is applied logically to

express. But this is not the case. If literally taken, it asserts only one side of its logical meaning. What the word *copula* very inadequately denotes is the form of the relation between the subject and predicate of a judgment. Now, in negative judgments, this form essentially consists in the act of taking a part out of the whole, and is as necessary an act of thought as the putting it in. The notion of one contradictory in fact involves the notions of the other.'

This is clearly right; and it is equally clear that the copula may exist in any form between absolute affirmation and absolute negation, or modified by any adverb. This last Sir William Hamilton, however, denies; he says, strangely enough, that in that case the mode is part of the *predicate*. He gives as an example of a modal proposition, *Alexander conquered Darius honourably*, and argues thus:* 'The pure proposition, *Alexander conquered Darius*, means, being resolved, *Alexander was the conqueror of Darius*: *Alexander* being the subject, *was* the copula, and *the conqueror of Darius* the

* Lect. on Log., Vol. I, p. 257.

predicate. Now, if we take the modal, *Alexander conquered Darius honourably*, and resolve it in like manner, we shall have, *Alexander was the honourable conqueror of Darius*; and here the whole difference is, that in the second the predicate is a little more complex, being, *the honourable conqueror of Darius*, and not, *the conqueror of Darius*.'

This is the same thing as resolving the negative proposition, *A is not B*, into the positive, *A is non-B*: in fact, negative propositions are, strictly speaking, modal; the modality in them lies in the negation, which is a part of the copula, of which the modality of every other modal proposition is likewise a part. *Alexander was the honourable conqueror of Darius*, is not the resolution of, *Alexander conquered Darius honourably*. Alexander might have been, *the honourable conqueror of Darius*, without there having been anything either *honourable* or *dishonourable* in this particular conquest. If, *Alexander was the honourable conqueror of Darius*, be the complete resolution of, *Alexander conquered Darius honourably*, i. e. if the former proposition mean neither more nor less than the latter, all categorical proposi-

tions having compound predicates of that kind—substantives qualified with adjectives—are æquipollent with modals where adverbs corresponding to the adjectives are attached to the copula. Thus, *John Brown was the poor but honest fisherman of the lake*, would be the same as, *John Brown fished the lake poorly but honestly*. It is clear, however, that the former might be true, though John Brown's poverty arose from his large family, and not from his being a bad fisherman, and though it was impossible for him to fish the lake dishonestly. The true resolution of, *Alexander conquered Darius honourably*, is, *Alexander was in an honourable manner the conqueror of Darius*, which is as modal as the original. Sir William seems to have been misled by the example chosen. Such an instance as, *Scott generally sat in this chair*, would at once have shown the error. No person would resolve that into, *Scott was the general sitter in this chair*, and assert that the two were identical. The modal particle, it may be distinctly laid down, does not qualify the predicate; it qualifies the copula, and relates to the subject of the proposition.

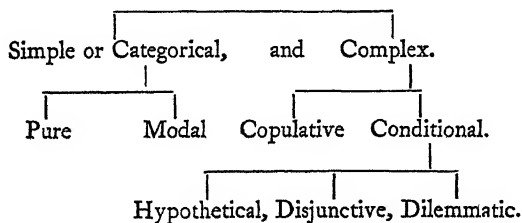
Modal propositions are sometimes put in a form that requires resolution to manifest clearly the nature of the modality. Thus, the proposition, *The destiny of nations may be the result of chance*, is more clearly expressed by, *The destiny of nations is possibly the result of chance*.

The division of propositions into *affirmative and negative*, and *pure and modal*, is too well established to be interfered with in an elementary treatise like the present; but a more logical division would be into *affirmative and modal*, holding *negative* propositions to be included in the latter. Unless otherwise expressed, we shall consider propositions as *pure affirmatives*, or *pure negatives*. The two divisions of propositions as to *quantity* and *quality*, which we have considered, are both complete, and based on different principles of classification. As might be supposed, therefore, they mutually traverse, and we have four different combinations which give distinctive marks to four different kinds of propositions, viz.:—
1, *universal affirmative*; 2, *universal negative*; 3, *particular affirmative*; and, 4, *particular negative*. Examples of these will suffice

without further explanation. 1, *All horses are solid-hoofed*; 2, *No birds are mammalia*; 3, *Some cows are shorthorns*; 4, *Some sheep are not black-faced*.

There is an universal and most useful notation in use among logicians for denoting by single letters the above classes, and thus indicating at once the quantity and quality of a proposition. It is this: A stands for universal affirmatives; E, for universal negatives; I, for particular affirmatives; and O, for particular negatives. Thus, *All kings are men*, is A; *John is a man*, is also A; *Some birds are eagles*, I; *Nouns are not adverbs*, E; *Some soldiers are not brave*, O.

There is another division of propositions, into *categorical* and *conditional*, which requires notice. It is not uncommon to divide propositions generally into



It is better to use the terms *simple* and

compound to distinguish the classes which depend on *grammatical* form, and employ *categorical* and *conditional* for those which have their difference in a *logical* point of view. Thus, *copulative*, in the classification given above, is what we have called *compound*: and such propositions being as frequently *categorical* as simple propositions, the above classification into *simple or categorical*, and *complex*, is manifestly a cross-division.

* The propositions which we have hitherto considered, whether *simple or compound*, *universal or particular*, *affirmative or negative*, *pure or modal*, have been *categorical*—that is, according to most logicians, in them the *predicate* has been simply affirmed or denied of the *subject*. According, however, to our view of modal propositions, in which the modal particle is connected with the copula, it would be inexact to give the above definition of *categorical* propositions, and we must define them to be, those in which the *predicate* is affirmed or denied of the *subject simply stated*. In a *conditional* proposition, the *condition* is attached solely to the subject. That condition being fulfilled, the predicate

is as simply affirmed or denied as in a categorical proposition. Conditional propositions are usually divided into three classes:—

1, *Hypothetical*: as, *If this storm increase, it will be worse than the last; If the storm get worse, the ship will become a wreck.*

Note that the former of these contains *three* terms, the latter *four*. 2, *Disjunctives*: as,

Either he will recover perfectly, or die soon; Either William will return, or James will go to him; That animal is either a man, or a monkey, or a dog, or a horse. It is obvious

that there may be any number of terms in a disjunctive proposition. 3, *Dilemmatic, or Hypothetico-disjunctive*: as, *If this be true, it is either known truth or unknown; If you have bought a horse, you have either bought a hackney, or a hunter, or a coach-horse.* It is obvious here that, as in the last class, the number of terms is indefinite.

We shall first consider *disjunctive* propositions: and it is easy to see that they are *compound hypotheticals*. *Either he will recover perfectly or die soon*, is equivalent to the two—*If he recover perfectly, he will not die soon; If he do not recover perfectly, he will*

die soon. Either William will return, or James will go to him, is similarly equivalent to If William return, James will not go to him; If William do not return, James will go to him.

The *dilemmatic* may be resolved in the same way. *If you have bought a horse, you have either bought a hackney, or a hunter, or a coach-horse, is the equivalent of—*

If you have bought a horse, and if you have not bought a hunter or a coach-horse, you have bought a hackney.

If you have bought a horse, and if you have not bought a hackney or a coach-horse, you have bought a hunter.

If you have bought a horse, and if you have not bought a hackney or a hunter, you have bought a coach-horse.

Which are compound *hypothetical* propositions.

We have only, then, really to consider the nature of *hypotheticals*, or, in other words, we may alter our division of propositions into *categorical* and *hypothetical*; and as we defined *categorical* propositions to be those in which the predicate was affirmed or derived of the *subject stated simply*, so we may define *hypothetical* propositions to be those in which the predicate is affirmed or denied of the *subject stated conditionally*. A *hypothetical* proposi-

tion is also one in which the subject and predicate are themselves propositions. A proposition *categorically* stated, in which the *subject* and *predicate* were themselves propositions, would be no longer a proposition, but a perfect act of reasoning; thus, we cannot combine the propositions, *John is a man*, *John is mortal*, without saying, *John is a man, therefore John is mortal*, which is not a proposition, but a defectively expressed syllogism; but there is nothing syllogistic in, *If John is a man, then John is mortal*. The explanation of this is, that it is not the proposition, *John is a man*, which is the real *subject* of the hypothetical, but it is the problematical question of its being true; the syllogism, *All men are mortal, John is a man, therefore John is mortal*, is already concluded as true, and the affirmation in the *hypothetical* is an affirmation dependent on the truth of the first proposition, but predicating nothing of that truth. An hypothetical proposition implies two categoricals, and can thus be put in the disjunctive form, *Either John is a man and a mortal, or John is not a man, and may or may not be a mortal*. We cannot reduce an hypo-

thetical proposition to a categorical; thus, *If John is a man, John is mortal*, cannot be stated as, *The FACT of John's being a man implies the FACT of his mortality*; but it may be put as, *The CASE of John's being a man will be a case of his mortality*, which is as purely hypothetical as the original proposition, and implies necessarily that, *The case of John's not being a man leaves the case of his mortality doubtful*. Mr. Mill says,* ‘a fresh instance is here afforded of the remark, that all particles are abbreviations. Since, “*If A is B, C is D,*” is found to be an abbreviation of the following: “*The proposition C is D is a legitimate inference from the proposition A is B.*”’ But this last proposition does not imply the same thing as the hypothetical *If A is B, C is D*; it is the result of some such reasoning as, *When E is, C is D, but' when A is B, E is, therefore when A is B, C is D*. The hypothetical takes this foregone conclusion for granted, but implies another conclusion as well, viz. *When A is not B, the inference that C is D is undetermined*.

We may now attend to a very useful matter

* Logic, B. I, cap. iv, § 3.

in our future investigations of the common doctrine of the syllogism, viz. the distribution of the *subject* and *predicate* in propositions; that is, of how much of the extension of the *subject* the *predicate* is affirmed or denied, and how much of the extension of the *predicate* is affirmed or denied of the *subject*. In universal affirmative and universal negative propositions it is obvious that the *subject* is taken in the whole of its extension, as, *men*, in, *All men are mortal*; *horse*, in, *No horse is amphibious*. In particular affirmatives and particular negatives, the *subject* is taken in only part of its extension, as in, *Some men are learned*, where men can only be taken in a very limited portion of its extension, as it is also in the negative, *Some men are not prejudiced*. In all affirmative propositions the *predicate* is affirmed in part of its extension only, and in all negative it is denied in the whole of its extension; thus, in, *All men are mortal*, the term, *mortal*, is only affirmed in so far as it is coextensive with the term, *man*, and nothing is affirmed of it in the rest of its denotation. In, *No men are infallible*, again, the whole extension or denotation of, *infallible*, is denied, and the same with the

particular negative, *Some men are not Africans*, where it is denied that these, *some*—which are not indefinite men, but certain particular men, viz. all who are not Africans—are, not *some Africans*, but *any Africans whatever*.

When a term is taken in the whole of its extension, it is said to be *distributed*; when in part of its extension, it is *undistributed*. Thus we have in the four classes of propositions the extension of the subject and predicate as follows :—

<i>Subject.</i>	<i>Predicate.</i>
A. Whole extension, or distributed.	Partial extension, or undistributed.
E. Whole extension, or distributed.	Whole extension, or distributed.
I. Partial extension, or undistributed.	Partial extension, or undistributed.
O. Partial extension, or undistributed.	Whole extension, or distributed.

Opposition is a relation among propositions which have the *same subject and predicate*, but differ in *quantity and quality*. It is divided into four kinds, *Contrary*, *Subcontrary*, *Subalternate*, and *Contradictory*.

Contrary opposition is when the predicate is affirmed in one proposition and denied in another of the whole extension of the subject ;

that is, when the propositions are A and E. Thus, *Some men are mortal*, and, *No men are mortal*, are contraries. It is obvious that two such propositions cannot both be true, but one may be true and the other false, or both may be false. These conditions are dependent on the nature of the matter of the propositions, which must be either *Necessary*, *Impossible*, or *Contingent*.

If the matter be *necessary*, all *affirmatives* must be *true*, and all *negatives false*.

If the matter be *impossible*, all *negatives* must be *true*, and all *affirmatives false*.

If the matter be *contingent*, all *particulars* must be *true*, and all *universals false*.

Applying these rules in the case before us, we have specially—

1. When the matter is *necessary*, of contraries, the *affirmative* must be *true*, and the *negative false*, thus :

All men are fallible, A, true.

No men are fallible, E, false.

2. When the matter is *impossible*, the *affirmative* must be *false*, and the *negative true*, thus :

All men are infallible, A, false.

No men are infallible, E, true.

3. When the matter is *contingent*, both are *false*; thus:

All men are vain, A, false.

No men are vain, E, false.

Sub-contrary opposition is when the *predicate* is affirmed in one proposition and denied in another of part of the extension of the *subject*; that is, when the propositions are in I and O; thus:

Some animals are omnivorous, I,

Some animals are not omnivorous, O,

are sub-contraries. Viewing them as we viewed *Contraries*, we have—

1. When the matter is *necessary*, of sub-contraries, the *affirmative* must be *true*, and the *negative false*; thus—

Some men are fallible, I, true.

Some men are not fallible, O, false.

2. When the matter is *impossible*, the *affirmative* is *false*, and the *negative true*; thus—

Some men are infallible, I, false.

Some men are not infallible, O, true.

3. When the matter is *contingent*, both are *true*; thus—

Some men are happy, I, true.

Some men are not happy, O, false.

This last, however, does not exactly come under the condition which we gave as requisite to opposition, the *subject* of the two propositions not being the same; the, *some men*, in the one case cannot be the, *some men*, in the other.

Subalternation is when the *predicate* is affirmed or denied in one proposition of the whole extension of the subject, and in the other is likewise affirmed or denied but of part of its extension only; that is, when the propositions are A and I, and E and O, thus—

All men are fallible, A;

Some men are fallible, I;

and

No men are infallible, E;

Some men are not infallible, O;

are *Subalternates*.

In regard to these, we see that—

1. The *truth* of the *universal* infers the *truth* of the *particular*, and the *falsehood* of the *particular* infers the *falsehood* of the *universal*; thus—

All men are mortal, A,
Some men are mortal, I, } true;

Some men are not mortal, O,
No men are mortal, E, } false;

2. The *falsehood* of the *universal* does not infer the *falsehood* of the *particular*, nor does the *truth* of the *particular* infer the *truth* of the *universal*.

All men are liars, A, false.

Some men are liars, I, true.

Some horses are not grey, O, true.

No horses are grey, E, false.

Contradictory opposition is when, in one proposition, the *predicate* is affirmed or denied of the whole extension of the *subject*; and in the other is respectively denied or affirmed of part of its extension only; that is, when the propositions are A and O, or E and I, thus—

All men are sinners, A,

Some men are not sinners, O;

and

No men are amphibious, E,

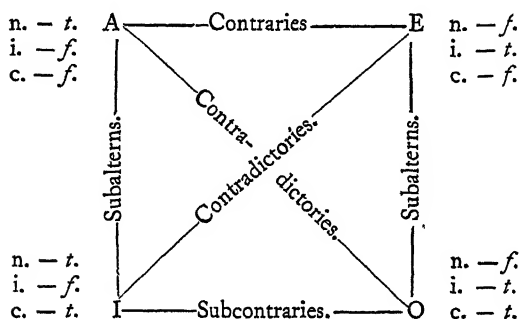
Some men are amphibious, I;

are Contradictories. As the opposition of Contradictories is both in quantity and quality, there can be but one rule for their truth or falsehood, viz. *one must be true, and the other false*.

The following scheme exhibits the relations of opposition of the four kinds of proposi-

tions, and their respective truth or falsehood, according to the nature of the matter.

t. = true. n. = necessary.
f. = false. i. = impossible. c. = contingent.



Propositions are logically *converted* when the *subject* and *predicate* of the original proposition, or *convertend*, become respectively the *predicate* and *subject* of the new proposition, or *converse*, and when the convertend and converse agree in quality, and in logical truth or falsehood. When this last condition is fulfilled, the conversion is said to be *illative*. In order, then, that conversion may be illative, no term in the converse must be distributed which was not distributed in the convertend. From the little table in page 76 we see that the only propositions in which the *subject*, and

predicate are in equal extension are universal negatives and particular affirmatives; in the former both terms being distributed, in the latter both are undistributed; they may, therefore, be converted simply, i. e. by simple inversion of the terms; thus:

No men are amphibious—convertend;

No amphibious creatures are men—converse.

Some men are envious, convertend;

Some envious beings are men, converse.

Universal affirmatives, in which the *subject* is distributed and the *predicate* undistributed, are converted by what is termed *accidental conversion*, in which the *quantity* of the proposition is changed, but the *quality* remains the same. This is effected through the subaltern proposition, which, being simply converted, gives the *accidental converse* of the convertend. In this way also universal negatives admit of accidental conversion. Thus, we have:

All men are mortal, convertend;

Some men are mortal, subaltern;

Some mortals are men, converse.

No men are quadrupeds, convertend;

Some men are not quadrupeds, subaltern;

Some quadrupeds are not men, converse.

Particular negatives are converted by *contra position*, i. e. by changing the *quality* of the proposition. Thus :

Some men are not liars, convertend;
Some men are not-liars, i. e. *truthful*;
Some who are truthful are men, converse.

The above is the common theory of conversion, but it is erroneous, as *all* propositions are simply convertible. The only thing is to attend to the quantity of the predicate when it is not explicitly stated—i. e. when it is *preindesignate*. In the proposition, *All men are mortal*, the predicate is not, *all mortals*, nor, *any mortals*, but, *some mortals*, where, *some*, has the sense of, *certain*= $\tau\iota\nu\epsilon\varsigma$, and the proposition is

All men are certain mortals, convertend;
Certain mortals are all men, is the simple converse;
 and,

Some men are not liars, convertend;
Those who are liars are not certain men, converse.

This view is partly developed by Dr. Thomson, who, in addition to the four kinds of propositions A, E, I, O, adds two others, which he calls *universal* and *particular*

substitutives, in which the predicate and subject are coextensive, and in which the one may be taken as the definition of the other. As examples of these he gives :

Chloride of sodium is common salt, U,
and
Some stars are all planets, Y.

The latter is the converse of *All planets are stars* ; only in the ordinary way, in the converse the predicate would be preindesignate, *Some stars are planets*. In reality, *all propositions are substitutive*.

Sir William Hamilton has the merit of putting this in its broadest and clearest point of view. ‘The self-evident truth,’* he says, ‘that we can only rationally deal with what we already understand, determines the simple logical postulate, *To state explicitly what is thought implicitly*. From the consistent application of this postulate, on which logic ever insists, but which logicians have never fairly obeyed, it follows :—that, logically, we ought to take into account the *quantity*, always understood in thought, but usually,

* Lect. on Log., V. II, App. p. 250.

and for manifest reasons, elided in its expression, not only of the *subject*, but also of the *predicate* of a judgment. This being done, and the necessity of doing it will be proved against Aristotle and his repeaters, we obtain, *inter alia*, the ensuing results:—

1. That the *preindesignate* terms of a proposition, whether subject or predicate, are never, on that account, thought as *indefinite* (or indeterminate) in quantity. The only indefinite is *particular* as opposed to *definite* quantity; and this last, as it is either of an extensive *maximum* undivided, or of an extensive *minimum* indivisible, constitutes quantity *universal* (general), and quality *singular* (individual). In fact, *definite* and *indefinite* are the only quantities of which we ought to hear in logic; for it is only as indefinite that particular, it is only as definite that individual and general quantities have any (and the same) logical avail.

2. The revocation of the *two terms of a proposition* to their true *relation*, a proposition being always an *equation* of its subject and predicate.

3. The consequent reduction of the con-

version of propositions from three species to one—that of *simple conversion*.’

It must be observed here, however, that we can only consider a proposition as an equation when it is affirmative. A negative proposition is the denial of equality between the subject and predicate. It is a modal proposition, the mode of which is the non-equality of the two terms. In this way the predicate of a negative proposition must be always considered preindesignate, and its simple conversion must always be liable to two forms. Thus,

<i>No man is infallible, E,</i>	convertend ;	
<i>None who are infallible are men, E,</i>		} converses ;
<i>Some who are infallible are not men, O,</i>		

and

<i>Some men are not liars, O,</i>	convertend ;
<i>None who are liars are some (i. e. certain) men, E,</i>	

and

Some liars are not some (i. e. certain) men, O, converses.

In fact, all modal propositions do more or less render the quantity of the inexplicitly quantified predicate preindesignate ; they bear the same relation to pure categoricals that such algebraic assertions as $a < b$, $a > b$, $a \neq b$, $a \propto b$, etc., bear to the simple equation $a = b$.

It may be useful to give here Sir William Hamilton's complete scheme of the coinclusion and coexclusion of the subject and predicate in propositions.* The greater the coinclusion, or the less the coexclusion, the *better* is the quantification; the greater the coexclusion, or the less the coinclusion, the *worse* is the quantification.

Best	1.	Identity or coinclusion.	Toto-total,	as, ALL common salt is ALL chloride of sodium.
	2.		Toto-partial,	„ ALL men are SOME mor- tals.
	3.		Parti-total,	„ SOME animals are ALL men.
	4.		Parti-partial,	„ SOME dogs are SOME fast- runners.
	5.	Non-identity or coexclusion.	Parti-partial,	„ SOME dogs are not SOME fast-runners
	6.		Parti-total,	„ SOME men are not ALL animals.
	7.		Toto-partial,	„ ALL men are not SOME creatures.
Worst	8.		Toto-total,	„ ANY man is not ANY dog.

We have omitted the peculiar symbolization of the author, as it is open to the same objection as any other system of the kind; the matter must be understood *before* it can be symbolized, and then what good of the symbol?

* Lect. on Log., V. II, App. p. 286.

CHAPTER IV.

OF SYLLOGISM.

WE have thus classified the various concepts formed by the human mind, under the denomination of Names, i. e. viewing them subjectively to the objects or attributes for which they stand; and we have further classified all possible propositions in which those names can be compared, and the degree of their agreement or disagreement declared. But human reason cannot stop here; there is another step to be gained before it has the full sweep of its powers—before it utilizes these elements of knowledge; it is this:—

We compare separately two given concepts with a third, with which one of them agrees, and by means of that comparison we judge of and declare the degree of their agreement or disagreement with each other; this whole process we perform by means of three pro-

positions, which taken together are called a *syllogism*.

Therefore, supposing a syllogism to be stated in words, and making the necessary changes in the language, we say : A syllogism is the name applied to three propositions taken together, in which we compare separately two terms with a third, with which one of them agrees, and by means of those comparisons declare the degree of their agreement or disagreement with each other, thus :

*All men are fallible,
All popes are men,
All popes are fallible.*

In considering the nature and laws of syllogisms, we shall in the first place give shortly, in the common form, the canons on which it is based, and the laws of mood and figure by which it is governed ; and afterwards, we shall endeavour to investigate those subjects in the more simple manner sketched out by Sir William Hamilton in some results, which are the sequels of those quoted in page 85.

The Aristotelian definition of a syllogism is—

A syllogism is a speech in which certain

things being supposed, something different from what is supposed follows of necessity, and this solely in virtue of the suppositions themselves.

The argument itself is based by Aristotle on what is entitled ‘the *dictum de omni et de nullo*,’ which may be stated thus, *whatever may be affirmed or denied of a genus in the whole of its extension, may be affirmed or denied of all its species;—or, whatever is predicated of a term distributed, whether affirmatively or negatively, may be predicated in the same manner of every thing contained under it:—or better still, whatever is predicated necessarily of a Logical whole, may be predicated of all its parts.*

What is predicated *accidentally* of a logical whole, or of a genus in part of its extension, may not be predicable of all its parts; thus, *MAMMALIA are to be found in every part of the world*, is true; but, *ELEPHANTS are to be found in every part of the world*, is false. Their, *being found all over the world*, is not necessary to the existence of the class MAMMALIA, nor would it in any respect alter the class were its *locus* restricted to a comparatively limited district. But such necessary predicates of MAMMALIA, as *Vertebrate, warm-blooded, &c.*

can be predicated of any of its constituent species.

From this are deduced two canons which no correct syllogism may violate :

1. *If two terms agree with one and the same third, they agree with each other.*

2. *If one term agrees, and another disagrees with one and the same third, those two disagree with each other.*

On the former of these rests the validity of affirmative conclusions, and on the latter of negative.

Some add a third canon, viz. :

3. *Two terms of which neither agrees with the same third, with which they are compared, may agree or disagree with each other.*

From these are deduced the following general rules of syllogisms:—

1. *A syllogism must have three, and only three, terms ; which are compared in three, and only three, propositions.*

As two of the three terms appear in each proposition, each term will appear in two propositions, in each of which it is compared with one of the other two. That proposition in which are compared the two terms whose

agreement or disagreement is supposed to be unknown *à priori*, is called the *conclusion*; its *subject* is called the *minor term*, and its *predicate* the *major term*; and these two terms together are called the *extremes* of the syllogism, the remaining term being called the *middle term*. Of the remaining propositions, the one in which the *major* and *middle* terms are compared is called the *Major Premise*, and the other, in which the *minor* and *middle* terms are compared, the *Minor Premise*.

2. *The middle term must be distributed in at least one of the premises; and if it be an equivocal or analogous name it must be used in the same meaning in both premises.*

It is obvious that if the middle term were only used in a part of its extension in each premise, it might be used in different parts of it, and so the major and minor terms might really be compared with *different* middle terms. Also, an equivocal or analogous name used in different significations in the two premises vitiates the syllogism in precisely the same way, by there being really *two* middle terms.

3. *No term in the conclusion may be distri-*

buted unless it was distributed in one of the premises.

The violation of this rule, which is called an *illicit process* of the major or minor term, would, by altering the term so used, introduce a fourth term into the syllogism. From this rule and the last it follows, as a corollary, that from two particular premises no conclusion can be drawn; for if the conclusion be affirmative, then the middle term cannot have been once distributed in the premises, and if it be negative, then the major term is distributed in the conclusion, and undistributed in the major premise.

4. *From negative premises you can infer nothing.*

5. *If one premise be negative, the conclusion must be negative; and if one premise be particular, the conclusion must be particular; or, as it is sometimes given, the conclusion follows the weaker part.*

We shall give examples of violations of these rules, or rather of the four last of them.

- | | | | |
|----|---|---|--------------------------|
| 2. | 1. <i>Some horses are grey,
Buckstone is a horse,
therefore, Buckstone is grey.</i> | } | Undistributed
middle. |
|----|---|---|--------------------------|

- | | | | | | | | |
|----|--|--|--|---|----|--|---|
| 2. | <i>It is well for a man to die
in harness,
A man grinning through a
horse collar is in harness,</i>
therefore, <i>It is well for a man to die
grinning through a horse
collar.</i> | Equivocal
middle. | | | | | |
| 3. | <i>Criminals are men,
Criminals deserve punish-
ment,</i>
therefore, <i>All men deserve punish-
ment.</i> | Minors dis-
tributed in con-
clusion, and un-
distributed in
minor premises. | | | | | |
| 4. | <i>A moss-rose is not an um-
belliferous plant,
A red cabbage is not an
umbelliferous plant,</i>
No conclusion. | Two negative
premises. | | | | | |
| 5. | <table border="0"> <tr> <td data-bbox="497 680 518 710">1.</td> <td data-bbox="528 680 735 771"> <i>No man is perfect,
John is a man,</i>
therefore, <i>John is perfect.</i> </td> <td data-bbox="859 665 994 778">A negative
premise and
affirmative
conclusion.</td> </tr> <tr> <td data-bbox="497 786 518 816">2.</td> <td data-bbox="528 786 818 895"> <i>All animals are organized,
Some animals chew the cud,</i>
therefore, <i>All organized beings chew
the cud.</i> </td> <td data-bbox="839 786 1015 895">One particular
premise, and an
universal con-
clusion.</td> </tr> </table> | 1. | <i>No man is perfect,
John is a man,</i>
therefore, <i>John is perfect.</i> | A negative
premise and
affirmative
conclusion. | 2. | <i>All animals are organized,
Some animals chew the cud,</i>
therefore, <i>All organized beings chew
the cud.</i> | One particular
premise, and an
universal con-
clusion. |
| 1. | <i>No man is perfect,
John is a man,</i>
therefore, <i>John is perfect.</i> | A negative
premise and
affirmative
conclusion. | | | | | |
| 2. | <i>All animals are organized,
Some animals chew the cud,</i>
therefore, <i>All organized beings chew
the cud.</i> | One particular
premise, and an
universal con-
clusion. | | | | | |

If we now in a syllogism affix to each proposition the letter indicating its quantity and quality, we have what is called the *mood* of the syllogism, which is the symbolical statement of the quantity and quality of its propositions: thus, the mood of the syllogism,

All men are rational,

All men are mortal,

therefore, *Some mortals are rational,*

is A A I.

Now, taking all the possible ways of combining A, E, I, and O in a syllogism, that is, the permutations of four things taken three together, we have sixty-four possible moods ; but few of these can be employed, as very many violate the rules just given. Some have two negative premises ; some, one premise negative and an affirmative conclusion ; some, both premises affirmative and a negative conclusion ; some, two particular premises ; some, one premise particular and an universal conclusion ; one, I E O, has the major term distributed in the conclusion and not in the premises ; and another, A E O, is superfluous, because when it can be used a general conclusion, E, may always be drawn, instead of a particular. In this way only ten of the combinations are employed : they are A A A, A A I, A E E, A E O, A I I, A O O, E A E, E I O, I A I, O A O.

The *figure* of a syllogism depends on the position of the middle term in the premises with regard to the two extremes. Looking at it as we have looked at the symbolizations in mood, we see that we can in the major premise have two arrangements, viz. the

middle term may be subject or predicate ; and in the same way we can have two arrangements of the minor term, and, combining these, we have four figures, or different arrangements of the middle term with the major and minor terms. Denoting the major term by P, the minor by S, and the middle by M, we have the four figures as follows :—

1st.	2nd.	3rd.	4th.
M P,	P M,	M P,	P M,
S M,	S M,	M S,	M S,
S P.	S P.	S P.	S P.

Or,

In the	First	Figure the middle term is in the major premise,	Subject,
	Second		Predicate,
	Third		Subject,
	Fourth		Predicate,
		and in the minor premise,	Predicate.
			Predicate.
			Subject.
			Subject.

Let us now try the moods we have given as legitimate, and we shall find that they are not necessarily so in every figure, that sometimes they are so in only one, and sometimes in more than one figure. For instance, A A A cannot be drawn in any figure but the first ; for, in the second, M would not be distributed

in either premise ; in the third, S would be distributed in the conclusion, but not in the minor premise ; and the same thing would occur in the fourth. Trying all the moods, then, we shall find that the ten legitimate, which we have given above, appear nineteen times in the four figures ; thus—

In the first A A A, E A E, A I I, E I O.

In the second A E E, A O O, E A E, E I O.

In the third A A I, A I I, E A O, E I O,

 I A I, O A O.

In the fourth A A I, A E E, E A O, E I O,

 I A I.

As several of the symbolical moods appear in more than one figure, and though apparently the same are in reality different, we must have some other means of distinguishing them ; accordingly, they have all received different names, which are comprised in the following lines :—

Barbara, Celarent, Darii, Ferioque prioris ;
Cesare, Camestres, Festino, Baroko, Secundæ ;
Tertia Darapti, Disamis, Damsi, Felapton,
Bokardo, Ferison habet ; quarta insuper addit
Bramantip, Camenes, Dimaris, Fesapo, Fresison.

Besides these, A A I and E A O, which are useful in the third and fourth figures,

might be drawn, the former in the first figure, and the latter in the first and second; but they are rejected in those figures for the same reason that A E O was generally rejected already, because the premises warrant an universal conclusion.

The following classification of the quantity and quality of all conclusions that can be drawn is, perhaps, more curious than useful :

Conclusion in	$\left\{ \begin{array}{c} A \\ E \\ I \\ O \end{array} \right\}$	In figures	$\left\{ \begin{array}{l} 1. \\ 1, 2, 4. \\ 1, 3, 4. \\ 1, 2, 3, 4. \end{array} \right\}$	Name of mood.	$\left\{ \begin{array}{l} \textit{Barbara.} \\ \textit{Celarent, Cesare, Ca-} \\ \textit{mestres, Camenes.} \\ \textit{Darii, Darapti, Dis-} \\ \textit{amis, Datisi, Bra-} \\ \textit{mantip, Dimaris.} \\ \textit{Ferio, Festino, Baroko,} \\ \textit{Felapton, Bokardo,} \\ \textit{Ferison, Fesapo, Fre-} \\ \textit{sison.} \end{array} \right\}$
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Examples of the nineteen moods of the four figures :—

	Fig. 1 st
General form,	M P, S M, S P.
Abstract,	1. <i>Barbara.</i> <i>All M is P,</i> <i>All S is M,</i> <i>All S is P.</i>

Concrete, *All men are liable to err,*
All philosophers are men,
All philosophers are liable to err.

2. Celarent.

Abstract, *No M is P,*
All S is M,
No S is P.

Concrete, *No mollusks are vertebrate,*
All gasteropods are mollusks,
No gasteropods are vertebrate.

*
 3. Darii.

Abstract, *All M is P,*
Some S is M,
Some S is P.

Concrete, *All mammalia are vertebrate,*
Some amphibia are mammalia,
Some amphibia are vertebrate.

4. Ferio.

Abstract, *No M is P,*
Some S is M,
Some S is not P.

Concrete, *No men are immortal,*
Some created beings are men,
Some created beings are not immortal.

Fig. 2.

General form, *P M,*
S M,
S P.

1. *Cesare.*

Abstract,

*No P is M,**All S is M,**No S is P.*

Concrete,

*No mammalia are mollusks,**All gasteropods are mollusks,**No gasteropods are mammalia.*2. *Camestres.*

Abstract,

*All P is M,**No S is M,**No S is P.*

Concrete,

*All good men are truly happy,**No envious men are truly happy,**No envious men are good.*3. *Festino.*

Abstract,

*No P is M,**Some S is M,**Some S is not P.*

Concrete,

*No mollusks are mammalia,**Some amphibia are mammalia,**Some amphibia are not mollusks.*4. *Baroko.*

Abstract,

*All P is M,**Some S is not M,**Some S is not P.*Concrete, *All who think rightly of their sins suffer the pangs of remorse,**Some wicked men do not suffer the pangs of remorse,**Some wicked men do not think rightly of their sins.*

Fig. 3.

General form,

M P,
M S,
S P.

1. *Darapti*.

Abstract,

All M is P,
All M is S,
Some S is P.

Concrete,

All planets go round the sun,
All planets are stars,
Some stars go round the sun.

2. *Disamis*.

Abstract,

Some M is P,
All M is S,
Some S is P.

Concrete,

Some Hindus are Sepoys,
All Hindus are Asiatics,
Some Asiatics are Sepoys.

3. *Datisi*.

Abstract,

All M is P,
Some M is S,
Some S is P.

Concrete,

All men are sinners,
Some men are just,
Some who are just are sinners.

4. *Felapton*.

Abstract,

No M is P,
All M is S,
Some S is not P.

Concrete, *No true fishes are mammalia,
All true fishes live in the water,
Some animals that live in the water are not
mammalia.*

5. *Bokardo.*

Abstract, *Some M is not P,
All M is S,
Some S is not P.*

Concrete, *Some traitors are not cowards,
All traitors deserve death,
Some who deserve death are not cowards.*

6. *Ferison.*

Abstract, *No M is P,
Some M is S,
Some S is not P.*

Concrete, *No rogues are honest men,
Some rogues are clever,
Some who are clever are not honest men.*

Fig. 4.

General form, P M,
 M S,
 S P.

1. *Bramantip.*

Abstract, *All P is M,
All M is S,
Some S is P.*

Concrete, *All horses are animals designed for the use of
man,
All animals designed for the use of man may
be tamed,
Some animals that may be tamed are horses.*

2. Camenes.

Abstract, *All P is M,
No M is S,
No S is P.*

Concrete, *All men are liable to err,
None who are liable to err are infallible,
None who are infallible are men.*

3. Dimaris.

Abstract, *Some P is M,
All M is S,
Some S is P.*

Concrete, *Some stars shine with a borrowed light,
All objects that shine with a borrowed light
may be eclipsed,
Some objects that may be eclipsed are stars.*

4. Fesapo.

Abstract, *No P is M,
All M is S,
Some S is not P.*

Concrete, *No birds are quadrupeds,
All quadrupeds are mammalia,
Some mammalia are not birds.*

5. *Fresison.*

Abstract,

*No P is M,
Some M is S,
Some S is not P.*

Concrete,

*No birds are quadrupeds,
Some quadrupeds are animals three feet high,
Some animals three feet high are not birds.*

It will be observed that in the positive moods of the first figure we, in the *major premise*, predicate the middle term as being totally contained in or included under the major term; then, in the *minor premise*, we predicate the minor term as being totally contained in or included under the middle term; and finally we, by the *dictum de omni*, conclude that the minor term is totally contained in or included under the major term. In other words, that the middle term is a species of the major term; that the minor term is again a species subalterna or an individual component of the middle term, and, therefore, that the minor term is a species or an individual component of the major term. Thus in the syllogism

*All men are fallible,
All popes are men,
All popes are fallible,*

we have

- I. 1st. SUMMUM GENUS—*Fallible beings*,
 containing 2nd. SPECIES SUBALTERNA—*Men*.
- II. 1st. PROXIMUM GENUS—*Men*,
 containing 2nd. SPECIES SUBALTERNA—*Popes*.
- III. 1st. SUMMUM GENUS—*Fallible beings*,
 containing 2nd. SPECIES SUBALTERNA—*Popes*.

In the syllogism

All popes are fallible,

Pius IX. is a pope, -

Pius IX. is fallible,

we have

- I. 1st. SUMMUM GENUS—*Fallible beings*,
 containing 2nd. SPECIES SUBALTERNA—*Popes*.
- II. 1st. SPECIES INFIMA—*Popes*,
 containing 2nd. INDIVIDUAL—*Pius IX*.
- III. 1st. SUMMUM GENUS—*Fallible beings*,
 containing 2nd. INDIVIDUAL—*Pius IX*.

In the negative moods of the first figure, again, we first affirm the total exclusion of the middle term from the major term. We then affirm that the minor term is contained in the middle term, and, therefore, conclude, by the *dictum de nullo*, that the minor term is totally excluded from the *major term*. Or, as before, the middle term is not a species of the major term; the minor term is a species or an individual component of the middle term; and, therefore, the minor term is not a species,

nor an individual component of the major term. Thus in,

*No birds are mammalia,
Some songsters are birds,
Some songsters are not mammalia,*

we have

- I. 1st. SUMMUM GENUS—*Mammalia*,
not containing 2nd. SPECIES SUBALTERNA—*Birds*.
II. 1st. PROXIMUM GENUS—*Birds*,
containing 2nd. SPECIES—*Some* (= τινες, *certain*)
songsters.
III. 1st. SUMMUM GENUS—*Mammalia*,
not containing 2nd. SPECIES—*Some* (= τινες, *certain*)
songsters.

By altering the order of the premises in the first figure we obtain another syllogism with the same conclusion, but with a totally different arrangement of thought. Thus, if we say

*All popes are men,
All men are mortal,
All popes are mortal,*

we infer that the term *popes* connotes *humanity*, or the concept *man* is invariably included in the concept *pope*; then that the term *man* connotes *mortality*, or that the concept *mortal* is invariably included in the concept *man*; and then we conclude that the term *pope* connotes *mortality*, or that the concept *mortal* is invariably included in the

concept *pope*. Thus giving the abstract and concrete syllogisms, we have the extensive syllogism,

M P, *All men are mortal*,
S M, *All popes are men*,
S P; *All popes are mortal*;

drawn in extension or breadth : and the intensive syllogism,

S M, *All popes are men*,
M P, *All men are mortal*,
S P; *All popes are mortal*;

drawn in comprehension or depth.

From these considerations, it is manifest that in the first figure we must always have

1st. *The major premise universal.*

2nd. *The minor premise affirmative.*

These special rules may be deduced from the general rules, of which they are only the special application to the first figure. Thus, the minor premise must be affirmative, for if it were negative the conclusion must be negative, and the predicate of the conclusion universal ; but the predicate of the conclusion is the predicate of the major premise, and when the minor premise is negative the latter must be affirmative, and its predicate particular. So the major would be taken universally in the conclusion, and particularly

in the major premise, which is contrary to the 3rd general rule. Since, then, the minor premise must be affirmative, its predicate, the middle term, will be particular, but it must, according to the 2nd general rule, be taken once universally; therefore it must be universal in the major premise, of which it is the subject, or the major premise must be universal.

In the second figure, in the moods which have the major premise affirmative, we predicate that the major term is totally contained in or included under the middle term; that the minor term is totally excluded from the middle term: and then we conclude that, as the one is totally included in and the other totally excluded from the same thing, the one cannot be included in the other. We proceed in the same way, *mutatis mutandis*, when the major premise is negative. Thus in the syllogism

*All truly good men are happy,
No envious men are happy,
No envious men are truly good.*

we have

- | | |
|------------|---|
| I. | 1st. SUMMUM GENUS— <i>Happy men.</i> |
| containing | 2nd. SPECIES SUBALTERNA— <i>Truly good men.</i> |

II. 1st. SUMMUM GENUS—*Happy men*.
 not containing 2nd. SPECIES SUBALTERNA—*Envious men*.

III. $\left\{ \begin{array}{l} \text{Two species of differ-} \\ \text{ent } \textit{genera} \text{ which} \\ \text{have no coinclusion,} \end{array} \right\} \begin{array}{l} \textit{Happy men} \\ \text{and} \\ \textit{Envious men.} \end{array}$

By inverting the premises of this, we, as in the first figure, change the form of thought with regard to the major and minor terms considered as predicate and subject of the conclusion, and obtain an intensive syllogism, of which the abstract figure is

S M,
 P M,
 S P.

It is evident, from its nature, that the second figure can have none but negative moods, as from the assertion that both the major and minor terms were species or individuals components of the middle term, we could not infer their coinclusion, and, therefore, we have as special rules,

1st. *One premise must be negative.*

2nd. *The major premise must be universal.*

Considering these as results of the general rules, we see that as the middle term is predicate of both terms, unless one were nega-

tive, the second general rule would be violated. And again, as one term is negative, the conclusion must be negative and its predicate—the major term—universal. Therefore, the major premise, of which the major term is the subject, must be universal, or we should violate the third general rule.

In the third figure, in the positive moods, we predicate that the middle is alike totally contained in or included under the major and the minor terms, and we, therefore, infer that a part of the minor term—viz. that part which is the middle term, is included in the major term. Thus, in the syllogism,

All planets go round the sun,

All planets are stars,

Some stars go round the sun,

we have

- | | |
|------|--|
| I. | 1st. SUMMUM GENUS— <i>Bodies that go round the sun.</i>
containing 2nd. SPECIES SUBALTERNA— <i>Planets.</i> |
| II. | 1st. SUMMUM GENUS— <i>Stars.</i>
containing 2nd. SPECIES SUBALTERNA— <i>Planets.</i> |
| III. | 1st. SUMMUM GENUS— <i>Bodies that go round the sun.</i>
containing 2nd. SPECIES SUBALTERNA— <i>Some (= τινές, certain) stars, viz. those which are planets.</i> |

In the negative moods of this figure we predicate, first, that the middle term is totally excluded from the major term; then, that it is totally or in part contained in or included under the minor, and conclude, therefore, that a part of the minor term is totally excluded from the major. Thus, in the syllogism,

No rogues are honest men,

Some rogues are clever,

Some who are clever are not honest men,

we have

- | | | |
|----------------|------|---|
| I. | 1st. | SUMMUM GENUS— <i>Honest men.</i> |
| not containing | 2nd. | SPECIES SUBALTERNA— <i>Rogues.</i> |
| II. | 1st. | SUMMUM GENUS— <i>Clever men.</i> |
| containing | 2nd. | SPECIES SUBALTERNA— <i>Some rogues.</i> |
| III. | 1st. | SUMMUM GENUS— <i>Honest men.</i> |
| not containing | 2nd. | SPECIES SUBALTERNA— <i>Some (=τινές, certain) clever men.</i> |

In the third figure, the syllogism in comprehension is formed by transposing the premises, as in the other two figures.

Were we in this figure to predicate, in extension, that the middle term was in whole, or in part, contained in or included under the major term, and then that it was totally excluded from the minor term, we plainly could not conclude from that whether any part of the minor term was included or ex-

cluded from the major. Therefore, from that, and what we have seen above, we must have in this figure,

1st. *The minor premise always affirmative.*

2nd. *The conclusion always particular.*

We can deduce these from the general rules thus—if the minor premise were negative, the major would be affirmative, and its predicate—the major term—particular, but the conclusion would be negative, and therefore its predicate—which is also the major term—would be universal; so the third rule would be violated by our having the major term distributed in the conclusion and not in the premises. Also, since the minor premise must thus be affirmative, its predicate, which is the subject of the conclusion, will be particular. Therefore, by the same general rule, the conclusion must be particular.

In the positive moods of the fourth figure, we predicate, first, that the major term is in whole or in part included in or contained under the middle term; then, that the middle term is wholly contained in the minor term; and so conclude that a part of the minor term (viz. as much of it as corresponds with that portion

of the middle term which is contained in the major term) is contained in or included under the major term. Thus, in the syllogism,

*All horses are animals designed for the use of man,
All animals designed for the use of man may be tamed,
Some animals that may be tamed are horses,*

we have

I. 1st. PROXIMUM GENUS—*Animals designed for the use of man.*

containing 2nd. SPECIES SUBALTERNA—*Horses.*

II. 1st. PROXIMUM GENUS—*Animals that may be tamed.*

containing 2nd. SPECIES SUBALTERNA—*Animals designed for the use of man.*

III. 1st. PROXIMUM GENUS—*Horses.*

containing 2nd. SPECIES SUBALTERNA—*Some animals that may be tamed.*

In the negative moods we either predicate that the major term is totally contained in or included under the middle term, and that the latter is wholly excluded from the minor term, and so conclude that the latter is wholly excluded from the major; or, we predicate that the major term is wholly excluded from the middle; that the latter is totally or in part included in the minor term, and so conclude that a portion of the minor term is not

included in the major. As examples, in the syllogism

*All men are liable to err,
None who are liable to err are infallible,
None who are infallible are men,*

we have

I. 1st. PROXIMUM GENUS—*Those who are liable to err.*

containing 2nd. SPECIES SUBALTERNA—*All men.*

II. 1st. PROXIMUM GENUS—*Those who are infallible.*

not containing 2nd. SPECIES SUBALTERNA—*Those who are liable to err.*

III. 1st. PROXIMUM GENUS—*Men.*

not containing 2nd. SPECIES SUBALTERNA—*Those who are infallible.*

In the syllogism

*No birds are quadrupeds,
Some quadrupeds are animals with long hair,
Some animals with long hair are not birds.*

we have

I. 1st. PROXIMUM GENUS—*Quadrupeds.*

not containing 2nd. SPECIES SUBALTERNA—*Birds.*

II. 1st. PROXIMUM GENUS—*Animals with long hair.*

containing 2nd. SPECIES SUBALTERNÆ—*Some (= τινές, certain) quadrupeds.*

III. 1st. PROXIMUM GENUS—*Birds.*

not containing 2nd. SPECIES SUBALTERNÆ—*Some (= τινές, certain) animals with long hair.*

This figure in extension is the same as the first figure in comprehension, only with

the conclusion inverted; and by transposing the premises, we in like manner obtain the fourth figure in comprehension, the same as the first in extension, only with the conclusion inverted; or, in other words, the conclusion of an intensive syllogism of the first figure is drawn in the fourth from the premises of the extensive syllogism of the first, and *vice versa*. This is easily seen by the abstract figures.

$$\begin{array}{ll} \text{1st Figure in extension} \left\{ \begin{array}{l} M P, \\ S M, \\ S P. \end{array} \right. & \text{4th Figure in comprehension} \left\{ \begin{array}{l} M S', \\ P' M, \\ S' P'. \end{array} \right. \\ \text{1st ditto in comprehension} \left\{ \begin{array}{l} S M, \\ M P, \\ S P. \end{array} \right. & \text{4th ditto in extension} \left\{ \begin{array}{l} P' M, \\ M S', \\ S' P'. \end{array} \right. \end{array}$$

where P' is the same as S, and S' as P.

Or in the concrete,

Syllogism in the 1st Figure. Syllogism in the 4th Figure.

1st Extensive.

All men are mortal,
All popes are men,
All popes are mortal.

2nd Intensive.

All popes are men,
All men are mortal,
All popes are mortal.

1st Intensive.

All men are mortal,
All popes are men,
Some mortals are popes.

2nd Extensive.

All popes are men,
All men are mortal,
Some mortals are popes.

For this reason, Sir William Hamilton* rejects the fourth figure altogether, as vicious, from a *cross* inference—i. e. drawing a con-

* Lect. on Log., Vol. I, p. 425.

clusion in comprehension from premises in extension, and *vice versâ*. This is not the case. However awkward and unnatural the figure may appear, it is legitimate in every respect. It requires but the proper explicit qualification of all three terms to show this clearly. Thus,

*All popes are certain men,
All men are certain mortals,
Some of those certain mortals just mentioned
are popes.*

Considering the nature of this figure, we see that its special rules must be stated hypothetically. They are,

1. If the mood is negative, the major premise must be universal.
2. If the major premise is affirmative, the minor must be universal, or if the minor premise is negative, both premises must be universal.
3. If the minor is affirmative, the conclusion must be particular.

A syllogism which violates the first or third special rules will violate the third general rule; if it violate the second special, it will violate the second general rule.

Of the four figures, the first is the most natural, whether in extension or in comprehension ; but the other figures are often rhetorically advantageous, and, in particular instances, they are necessary from the nature of the premises, which can alone be employed. All the moods of the other figures, except two, can be reduced to moods of the first by conversion and transposition, and the names of the various moods are so formed as to indicate, by various letters, the operation to be effected on the propositions. These we shall now proceed to explain as shortly as possible.

The names of the moods which we have employed are specially framed to assist in the work of reducing those of the three imperfect figures to the first. And first, the four moods of the first figure commence respectively with the consonants B, C, D, and F, and one of these consonants commences the name of every other mood which can be reduced to the mood of the first commencing with that consonant ; thus—

Baroko, *Bokardo*, *Bramantip*, are reducible to *Barbara*.
Cesare, *Camestres*, *Camenes*, to *Celarent*.

Darapti, Disamis, Datisi, Dimaris, to Darii.

Festino, Felapton, Ferison, Fesapo, Fresison, to Ferio.

There are two kinds of reduction by which this is effected—1. *Direct*, or *ostensive*; 2. *Indirect*, or *per impossibile*. The latter is seldom used but in reducing the moods *Baroko* and *Bokardo*, and is indicated by the letter *k* in their names. The former is employed for all other moods, and the different processes that they have to undergo are shown by the occurrence of the consonants *m*, *s*, and *p*; *m* indicates that the premises of the mood in whose name it occurs are to be *transposed*; *s*, that the proposition designated by the *preceding* vowel is to be *simply* converted; while *p* denotes, in the same way, that the preceding proposition is to be converted *per accidens*.

One example will suffice: let us take *Disamis*. The *m* shows conversion of the premises of which the original major must first be simply converted, as denoted by the first *s*; then the final *s* shows that the conclusion must likewise be simply converted. *Dimaris* is—

Some M is P',

All M is S',

Some S' is P'.

Reduced it becomes—

*All M is S',
Some P' is M,
Some P' is S'.*

or putting S for P', and P for S',

*All M is P,
Some S is M,
Some S is P.*

which is *Darii* as required.

The reduction *per impossibile* is simply showing that if the conclusion be false, and therefore its contradictory true (see p. 80), then one of the premises in the given syllogism must be false; but they are hypothetically true, therefore the contradictory of the conclusion is not true, *i.e.* is false, and, therefore, the conclusion is true: and this is done by a syllogism in the first figure. If the figure to be (what is called) reduced be *Bokardo* or *Baroko*, the syllogism required will be in *Barbara*, and it is thus prepared: the contradictory of the conclusion is substituted for the minor premise in *Baroko*, and for the major in *Bokardo*, and from this and the other universal premise a conclusion in A is drawn which is

the contradictory of the supplanted premise in O, and then the effects follow.

Thus in *Baroko*,

All P is M,
Some S is not M,
Some S is not P.

we make the syllogism,

All P is M,
All S is P,
All S is M.

But it is granted that '*Some S is not M*;' therefore, as this last syllogism is good as a syllogism, the premises must be false; but the major premise is already granted, therefore the minor is false; therefore the proposition, '*Some S is not P*,' is true.

In *Bokardo*,

Some M is not P,
All M is S,
Some S is not P,

we make

All S is P,
All M is S,
All M is P.

But it is granted that '*Some M is not P*,' and that '*All M is S*,' therefore it is false that

All S is P, therefore, at least, *Some S is not P* must be true.

Let us take *Ferison*—

No M is P,
Some M is S,
Some S is not P.

We make in *Celarent*,

No P is M,
All S is P,
No S is M;

but, *Some M is S*, and, *No P is M*—that being the simple converse of, *No M is P*—are admittedly true, therefore it is not true. that, *All S is P*, and true, at least, that, *Some S is not P*.

CHAPTER V.

OF THE EXPLICIT QUANTIFICATION OF THE
PREDICATE.

THE results which Sir William Hamilton obtained from the *quantification of the predicate*, and which form the bases of his 'New Analytic of Logical Forms,'* are the following :—

'1. That the *preindesignate terms* of a proposition, whether subject or predicate, are never, on that account, thought as indefinite (or indeterminate) in quantity. The only indefinite is *particular*, as opposed to *definite* quantity; and this last, as it is either of an extensive *maximum*, undivided, or of an extensive *minimum*, indivisible, constitutes quantity *universal* (general) and quantity *singular* (individual). In fact, definite and indefinite

are the only quantities of which we ought to hear in Logic ; for it is only as indefinite that particular, it is only as definite that individual and general, quantities have any (and the same) logical avail.

‘ 2. The revocation of the *two Terms of a proposition* to their *true relation* ; a proposition being always an *equation* of its subject and predicate.

‘ 3. The consequent *réduction* of the *Conversion of Propositions* from three species to *one*—that of Simple Conversion.

‘ 4. The reduction of all the *General Laws of Categorical Syllogisms* to a *Single Canon*.

‘ 5. The evolution from that *one canon* of all the *Species and varieties of Syllogism*.

‘ 6. The abrogation of all the *Special Laws of Syllogism*.

‘ 7. A demonstration of the *exclusive possibility of Three Syllogistic Figures* ; and (on new grounds) the scientific and final *abolition of the Fourth*.

‘ 8. A manifestation that *Figure* is an *unessential variation* in syllogistic form ; and the consequent *absurdity of Reducing* the syllogisms of the other figures to the first.

‘9. An enunciation of *one Organic Principle* for *each Figure*.

‘10. A determination of the true *number* of the legitimate *Moods*; with

‘11. Their *amplification* in number (*thirty-six*).

‘12. Their numerical *equality* under all the figures.

‘13. Their *relative equivalence*, or virtual identity, throughout every schematic difference.

‘14. That, in the *second* and *third* figures, the extremes holding both the same relation to the middle term, there *is not*, as in the first, *an opposition and subordination between a term major and a term minor, mutually containing and contained, in the counter wholes of Extension and Comprehension*.

‘15. Consequently in the *second* and *third* figures, there is *no determinate major and minor premise*, and there are *two indifferent conclusions*; whereas, in the *first* the *premises* are *determinate*, and there is a *single proximate conclusion*.

‘16. That the *third*, as the figure in which *Comprehension* is predominant, is more appropriate to *Induction*.

‘ 17. That the *second*, as the figure in which *Extension* is predominant, is more appropriate to *Deduction*.

‘ 18. That the *first*, as the figure in which *Comprehension* and *Extension* are in *equilibrium*, is common to *Induction* and *Deduction*, indifferently.’

We have already considered the three first of these results, which deal with propositions, and, in so doing, we observed, that the assumption that a proposition is always an equation of its subject and predicate, is too general, and not in accordance with fact—that the whole class of modal propositions, including in it negative propositions, does not consist of propositions which are equations, but which correspond with the mathematical forms, $a \neq b$, $a > b$, $a < b$, $a \propto b$, &c.*

* If we could make any legitimate inference from the analogy between a proposition and these algebraical forms, it would certainly be this—that in modal propositions the *mode* lies wholly in the *copula*. But such forms are only useful as affording explanatory analogies, and not as grounds of legitimate inference: that the *mode* of a proposition inheres solely in the *copula* must be shown from *logical*, not *mathematical*, premises, the latter being only a special case of the former.

What Dr. Thomson says (Laws of Thought, p. ii.

Still this does not render the quantity of the *subject* or of the *predicate* more indefinite than in a pure categorical proposition.

§ 44) is, 'The modality of a judgment is not part of itself, and does not belong to the copula—as seems to be shown by the fact that the degree of certainty about the same judgment fluctuates in the mind of the same person at different times and, still more, in different persons, the mode of expression remaining unaltered.' But surely this uncertainty refers solely to the *copula*, and to *its* mode. The *subject* and *predicate* remain the same, whether they have their places in a modal or in a pure proposition; the mode, however, must affect some part of the proposition, and there is nothing left for it to affect but the *copula*. As, analogously, we may doubt whether $a > b$, or $a < b$, still a and b are the same, and it is the sign which expresses the relation of magnitude between them, therefore, that is the part of the formula which will be affected by the resolution of the doubt, and in which the doubtful element must inhere. So in a proposition.

There is no doubt of the existence of *Zeno of Elea*, or of there being *an inventor of dialectic*; therefore the doubts which may be entertained as to the evidence on which the proposition, *Zeno of Elea was the founder of dialectic*, rests, apply to the truth of the *copula* only. This proposition, which is that given by Dr. Thomson as an instance of a *modal*, is strictly *pure*, and any doubts that we may have as to its truth no more make it a *modal* than if meeting in a book the unconnected proposition, *John is a man*, and doubting whether the, *John*, referred to be really a *man*, or a favourite *dog*, or *bird* so-called, such doubts would render *modal* that *pure* categorical. Should

The third result is not so clearly manifest at once as it might be, on account of the equivocal use of the word '*some*.' Sir Wm. Hamilton* gives *some* two meanings in Logic: '1st. It may mean *some and some only*, being neither *all* nor *none*, and in this sense it will be both affirmative and negative. 2nd. It may mean, negatively, *not all, perhaps none, some at most*; affirmatively, *not one, perhaps all, some at least*.' And again he says,† 'The *some*, if not otherwise qualified, means *some only*,—this by presumption.' Dr. Thomson says,‡ 'The word *some* is likewise the cause of confusion in its logical use. In what sense is the *some* of a particular proposition to be understood? Does

we even take such a truly *modal* proposition as, *Zeno of Elea was probably the founder of dialectic*, it is equally clear that the *mode* applies solely to the *copula*. If we put the proposition into the *pure* form, *Zeno of Elea was the probable founder of dialectic*, it is no longer the same proposition, and we do not predicate the probability of *Zeno's* being, *the founder of dialectic*; but we assert, that *Zeno* was the individual who was, *the probable founder of dialectic*, or, that, *if there were a founder of dialectic* it was *Zeno*, while in the *modal* we assumed that, *there was a founder of dialectic*.

* Lect. on Log., V. II, app., p. 230.

† Id. p. 254.

‡ Laws of Thought, p. ii. § 45.

it mean, "Some, we know not how many?" or, "A certain number, which we have in our thoughts?" Suppose that historical reading leads to the conviction that "Some democratic governments have ended in a tyranny," it may be doubtful whether this result includes precisely those democracies which we have found in our researches were consummated by despotism, and no others, in which case the conception in our minds is definite and precise, though conveyed in an ambiguous expression, or only expresses that this has occasionally happened to democracies, possibly to others besides those which we have studied, in which case the conception "some democracies" would be purely indefinite. The word appears to be employed in the two senses of "some or other," and of "some certain," in common language; and it becomes a question in which sense it is regarded in Logic. Now the different steps in attaining knowledge are marked by the acquirement of new laws or rules, that is to say, of universal judgments, expressing that to the whole of a given class of things or facts some mark or property belongs. And wherever a

definite number of things is ascertained to possess a mark, it is the tendency of the mind to set them apart from other things that most resemble them, by some name, which may stand for them both in thought and speech, for the sake of making the statement universal. If by "Some democracies have ended in despotism," we mean simply to assert that in three or four countries, with the history of which we are familiar, and which we could name, this result has occurred, the statement is really universal, only our subject is a species only of the genus "democracies;" and we ought to say "The democracies (three or four) whose history we have traced." But as our having studied them is not of importance enough to found a distinction upon, a universal assertion of this kind would have no philosophical value; and by "Some democracies end in despotism" we should mean to declare that in trying to find the agreement between these two terms, we had not succeeded in establishing the rule, the universal judgment, but that a partial agreement had appeared, the extent of which, though it was discovered from some particular

cases, was not, so far as we knew, limited to them, but remained thoroughly indefinite. Every turn then which, though indefinitely expressed, refers to a definite class of things, should be rendered definite. Wherever the things denoted by the subject are really definite, as having some marks that group them in a smaller class by themselves; science requires that, instead of appearing as part of the larger, they should have their own name and position.'

But, according to Sir William Hamilton, 'Logic is a purely formal science: it knows nothing of, it establishes nothing upon the circumstances of the matter to which its form may chance to be applied.' We accept this *dictum* in its widest meaning; and according to it, *some* must always in *Logic* be considered definite. It is *extra-logical* to enquire whether by *some* we mean a whole *genus*, a single *species*, or a few *individuals*: it is enough that, *the same terms have always the same real quantity in the same proposition*, in immediate reasoning, and in mediate reasoning that the terms in the *conclusion* are truly the same, or part of the same terms that were the *major* and *minor*

in the premises; and, that if the *middle* term be taken in its full extension in one premise, and in only part of it in another, then, that latter should be truly a part of the first, and that every such part of a term should be one member of a dichotomous division. Thus in the syllogism,

All men are mortal,
Some men are fools,
Some fools are mortal,

we have, stating it explicitly, i. e. as it ought to be stated as a subject of logical analysis,

All men are some mortals,
Some men are some fools,
Some fools are some mortals.

And all that the *logician* requires in it is, that the, *some mortals*, in the *conclusion* should be truly a part of the, *some mortals*, in the *major* premise; that the, *some fools*, in the *conclusion* should be the same, *some fools*, in the *minor* premise, or a part of them—*fools*, being divided into, *those that are men*, and, *those that are not men*—and that the, *some men*, in the *minor* premise should be part of the, *all men*, in the *major*, the, *all men*, being divided into, *those*

who are fools, and, those who are not fools. As to, *some mortals*, in the *major*, we must mean, *all mortals who are men*; but whether we absolutely know that the, *some men*, in the *minor* really are, *all the men who are fools*, or not, is not a question for the logician; they are simply, *certain men*, be their number more or less: but of these certain men, whatever their number be, it is predicated that they are individually fools, and *that as universally as* though they were all specified by name. In the same way, it is a matter of no logical import if the, *some*, or *certain fools*, in the conclusion be, *all the fools who are men*, or all the fools who are the, *some fools*, in the minor term, provided that they are either a part or the whole, and no more than the whole, of the latter..

If we take the following propositions—

John is a certain mortal, (1)

Some stars are all the pointers, (2)

*Some Roman Emperors were all the twelve
Cæsars,* (3)

Some men are all Mahometans— (4)

In (1) we have the *subject individual*, and it is generally allowed that the proposition is

an universal; but in (2) the, *some stars*, are, *two certain particular individual stars*, and *no others*; in (3), *Some Roman Emperors*, are, *certain twelve individual Emperors of Rome*, and *no others*; and in (4), *Some men*, are *certain individual men who believe in the Mahometan religion*, be the number of them known or unknown, and *no others*; and it is predicated as certainly in (2) that the, *some stars*, are, *the pointers*, in (3) that the, *Some Roman Emperors*, are, *the twelve Cæsars*, in (4) that the, *some men*, are, *Mahometans*, as it is in (1) that the individual, *John*, is, *a certain mortal*; and we are logically bound to consider any of these last propositions to be precisely the same as the first, or A.

In the same way,

Some men are not any angels,

is logically the same, and as much E, as the proposition,

Julius Cæsar was not a Greek.

The quantity of propositions is useful solely for the purposes of *conversion by accident*, and *by contraposition*, and when these are abrogated it may go with them.

This logical casting out of what are called *particular* propositions, or considering propositions to have all the same quantity, but to differ only in quality, reduces them, taking the usual view of their quality, into two varieties only, A and E, and these both simply convertible. It would be more correct to classify them into *pure* and *modal*, the latter including *negatives* of every kind, while the former would include only what are called at present *pure affirmatives*. Of these the *pure* would be classed as A; absolute unconditional negatives as E; and other letters taken for the other kinds of *modals*; but their kinds are so various as to be practically innumerable, and to render the most elaborate classifications inadequate. Upon the whole, therefore, though not the most scientifically correct, the ordinary classification of propositions into pure and modal, and the former into 'affirmatives and negatives, is practically the best; and we shall class all propositions under the letters A and E, rejecting I and O. This classification reduces the possible mood-forms of the syllogism to *three*, viz. : AAA, EAE, and AEE, as EEE is inadmissible. When the predi-

cate is quantified and therefore definite, AEE can appear in the first figure, and AAA in the second. All the forms can appear in the third and fourth. So the total number of syllogistic moods is *twelve*.

Sir William Hamilton's fourth result is more clearly true in this view of the universal quantity of propositions than in his own. His general canon is,* 'What worse relation of subject and predicate subsists between either of two terms and a common third term, with which one at least is positively related, that relation subsists between the two terms themselves.' This canon is not more simple than the three canons commonly given (p. 91). It requires a formal explanation of *worse relation*, while *they* are intelligible of themselves, and can be applied as they are given. Sir William Hamilton also complicates the already existing two-fold variety of *worse relation* by introducing a *better and worse relation* in negatives, and ends by giving seven degrees of worse relation (see p. 87). In the view we have taken there is only one kind of worse relation, *negative worse than affirmative*. If

* Lect. on Log., V. II, app., p. 285.

both terms agree with the third, they agree with one another; if one disagrees with the third, they disagree with one another; if both disagree with the third, no conclusion can be come to. These are the three usual canons, but the third may be omitted, as, from the definition of the syllogism, the case to which it applies cannot occur. The syllogistic canons are axioms which are natural to the rational human mind, and of which the origin cannot be traced to experience, which lie at the foundation of all reasoning (in the true sense of the term), which are used continually by all rational men—though their use is only made sensibly manifest when it is required to make a thorough analysis of reasoning—and of which the total, or partial want in the mind of any individual constitutes a corresponding degree of idiocy.

With regard to the *results* which follow No. 4, to the thirteenth inclusive, we may remark; that No. 6 is contradicted by Nos. 5, 9, and the whole of Sir William Hamilton's twelve cases of co-inclusion and co-exclusion; each of which is again subdivided into two, making twenty-four special laws under his

single canon. Again, in No. 8, 'the *absurdity of reducing* the syllogisms of the other figures to the first' cannot be virtually done away with, if, according to No. 13, we are to shew —speaking of the thirty-six moods, which Sir William Hamilton allows — 'their *relative equivalence*, or virtual identity throughout every schematic difference.' With regard to No. 7, we need only say, as we said before, that however awkward it may seem, and however much the inverted conclusion may take the mind by surprise, yet as long as a valid inference is always drawn from the given premises, the *fourth* figure must be as possible and as valid as the *first*.

No. 14 is simply the old assertion that the *dictum de omni et de nullo* does not apply to any but the *first* figure.

Nos. 16, 17, and 18 we are not yet sufficiently advanced with our subject to discuss.

From what we have said, it will be seen that we have now validated one new mood-form in the first figure, viz. AEE : the special rule that 'the minor premise must be positive' being no longer necessary when the predicate

is duly quantified. This mood is in the abstract,

All M is all (or some certain) P,
No S is any M,
No S is all (or those certain) P.

In the concrete,

All planets are certain stars,
No comets are planets,
No comets are those certain stars.

Also in the second figure we abrogate the rule that 'one of the premises *must* be negative ;' and we have in the case where either the predicate or the subject includes *all* the middle term, a syllogism in AAA ; it is either,

All (or some certain) P is all M,
All (or some certain) S is all (or some certain) M,
All (or those certain) S is all (or those certain) P.

or,

All (or some certain) P is all or some certain M,
All (or some certain) S is all M,
All (or those certain) S is all (or those certain) P.

And in the case where the middle term is particular in both, we have also,

All (or some certain) P is some certain M,
All (or some certain) S is those certain M,
All (or those certain) S is all (or those certain) P.

In the third and fourth figures the three moods will all appear naturally.

As we have now but one form of conversion, in order to reduce the moods in the three last figures to those in the first, we need only give them names which have the indicative letter *s* after the propositions to be converted, and instead of the mnemonic lines given in p. 97, we shall have a shorter and simpler set, such as,

Arbara, Barente, Celarent ;
Astarta, Basete, Cesarte ;
Alasta, Baleste, Cenastre ;
Asasa, Bastese, Cresasent ;
Modi sunt bis sex, quatuor contenti figuris.

Although we hold that the foregoing is the correct view of the Theory of Propositions, and of Syllogisms, when the *predicate* is explicitly quantified, we must not be understood to advocate the total rejection of the ancient method of classing propositions according to both quantity and quality ; or the study of the three kinds of conversion. From the general form in which propositions are stated in ordinary reasoning, the vast majority have the *predicate* preindesignate, and it is often, if

not more convenient, at least less open to captious animadversion to investigate their validity by those rules which are universally recognised as legitimate. Besides, there is no subjective error involved in the theory on which these rules are based; only they are more complicated than the others in their nature, and require more ingenuity in their application; which is in itself a recommendation, of a kind, in a study of which one principal object is to sharpen the wits of the student.

CHAPTER VI.

OF NON-CATEGORICAL AND IMPERFECT
SYLLOGISMS.

SEVERAL classes of syllogism are *non-categorical*; that is, have one or both of the premises *non-categorical* propositions.

The *non-categorical* propositions which we considered were, the *Compound*, *Hypothetical*, *Disjunctive*, and *Hypothetico-disjunctive*. Besides these, logicians have given names to numerous other classes, such as *Adversative*, *Causal*, *Exclusive*, *Inceptive*, *Disceptive*, *Reduplicative*, &c. &c. Some of these are *modal*, some are *compound*; and some are not, properly speaking, propositions, but what are commonly called *Enthymemes*, or syllogisms with one suppressed premise. As usual when very complicated divisions are attempted, and very nice distinctions relied on, the real difficulties of the various species are overlooked, and a woeful cross-division is the result.

Before proceeding to consider non-categorical syllogisms, we may mention that when a syllogism has a *modal* proposition as *either of the premises*, the *mode* appears in the *conclusion*; and when *both premises* are *categorical*, the *conclusion* cannot be *modal*. This is merely the full extension of the rule: 'The conclusion follows the weaker part.'

The *hypothetical syllogism*, or, as it is frequently called, the *conditional*, is a syllogism which has a *hypothetical* proposition as *major* premise. Its abstract forms are:—

If A ^{is,} is not,	B ^{is,} is not,	If A ^{is,} is not,	B ^{is,} is not,
But	A ^{is,} is not.	But	B ^{is not,} is .
Therefore	B ^{is,} is not.	Therefore	A ^{is not,} is .
If A ^{is not,} is ,	B ^{is,} is not,	And If A ^{is not,} is ,	B ^{is,} is not,
But	A ^{is not,} is .	But	B ^{is not,} is .
Therefore	B ^{is,} is not.	Therefore	A ^{is.} is not.

Putting one of the above forms in the concrete, let us take the hypothetical syllogism,

If *John be a man*, *John is mortal*,
But *John is a man*,
Therefore *John is mortal*.

This syllogism merely fixes the truth of the antecedent of the hypothetical, viz. *If John be a man.* As we showed, when discussing hypothetical propositions, there is a suppressed proposition implied in the very statement of the hypothetical; we assume in it that, *All men are mortal.* This supposition remains in the syllogism, which, when fully stated, is—

*All men are mortal,
If John be a man, John is mortal,
But John is a man,
Therefore John is mortal.*

In this, *If John be a man, John is mortal,* is redundant, and the categorical expression is—

*All men are mortal,
John is a man,
John is mortal.*

What is really affirmed in the hypothetical syllogism is, that *John is mortal, unconditionally.* The *minor* premise is the enunciation of a *decision* as to the hypothetical subject of the *major*, which is not formed or proved in the syllogism, but which is the result of other acts of reasoning. By this *decision*, the con-

dition being removed, the *conditional* predicate of the *major* is stated as the *categorical conclusion* of the syllogism.

In a hypothetical syllogism, it is clear that
1st. The *major* must be always affirmative, as between subject and predicate. 2nd. The *minor*, or *decision*, must agree in quality with the *subject* of the *major*, and the *conclusion* with its *predicate*. Thus—

*If John be a man, John is mortal,
John is not a man,
Therefore he may be mortal or immortal.*

*If John be not a rogue, he is a fool,
But John is a rogue,
Therefore he may or may not be a fool.*

There may, however, be occasionally such a contradiction between the terms of the subject and predicate of the *major* premise, that though the *minor* is of the *opposite* quality to the former of these, a correct *conclusion* may be drawn, likewise, of the *opposite* quality to the latter ; thus,

*If John be not a man, he is an angel,
But John is a man,
Therefore he is not an angel.*

Such a syllogism is really not a *hypothetical*, but a *disjunctive*, for the *major* premise, properly and clearly stated, is,

John is either a man or an angel,

which is a combination of two hypothetical propositions: *If John be a man, he is not an angel; If John be an angel, he is not a man;* and thus admits of a double *conclusion*.

A disjunctive syllogism has a disjunctive proposition in the *major*. The abstract formulas are,

<i>Either A, or B, or C, or E, or X is, But A (or B, or C, or E, or X) is, Therefore B, and C, and E, and X (or and A) are not.</i>	}	(1)
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<i>Either A, or B, or C, or E, or X is, But neither B, nor C, nor E, nor X (nor A) is, Therefore A (or B, or C, or E, or X) is.</i>	}	(2)
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(1) is said to be in the *modus ponendo tollens*, and (2) is the *modus tollendo ponens*.

In this syllogism the *minor* is a *decision*, and the conclusion is the affirmation or denial of the existence of all the terms in the *major* to which the *minor* does not relate. We have shown, in treating of propositions, that a *disjunctive*

proposition is a *compound* proposition, being resolvable into as many *hypotheticals* as there are terms in itself; therefore a disjunctive syllogism may be resolved into as many hypothetical syllogisms as there are terms in the *major*. If the *minor* is *categorical* it is the common minor of all these; and the *conclusion* is *compound*, being the united conclusions of them all. But if the *minor* is *compound*, it is the united *minors* of all the *hypothetical* constituent syllogisms, and the conclusion is *categorical* and is the common conclusion of them all.

To take a concrete example :

*Either James will come or William,
But James will come,
Therefore William will not come.*

The *major* is the combination of the two *hypotheticals* : *If James comes, William will not come*, and, *If William comes, James will not come*. The *decision*, *James will come*, which is the *minor*, removes simultaneously the condition in both of them, and warrants the unconditional statement of the predicate of the former as the *conclusion* of the syllogism, just

as the opposite *decision*, *William will come*, would warrant as the *conclusion* the *unconditional predicate* of the latter. It is obvious that the *hypotheticals* might be inverted, *If William does not come, James will come*; *If James does not come, William will come*, and the corresponding disjunctive syllogism would be,

*Either James will come or William,
But William will not come.
Therefore James will come,*

The choice of form lies in the *decision* that can be most readily given; in whether we can affirm the more easily that, *James will come*, or, *William will not come*. The suppressed proposition which is necessary alike to the *disjunctive* proposition in this example, and to the syllogism in which it is a premise, is, *One and one only will come*.

If in a syllogism with a *disjunctive major* the subject of the *conclusion* is not a term of that premise, the syllogism is not a *disjunctive* syllogism, but a *categorical*; thus in the abstract,

*A is either B, or C, or &c., or X,
But Z is A,
Therefore Z is either B, or C, or &c., or X;*

in the concrete,

*Gardeners are either conceited, or fools, or both,
But John is a gardener,
Therefore John is either conceited, or a fool, or both.*

In the true *disjunctive* syllogism the major must always be affirmative, and the *minor* and *conclusion* must differ in quality.

When a syllogism has a *hypothetico-disjunctive* proposition for the *major*, it is called a *dilemma*. In it the *minor* is *disjunctive*, and the *conclusion*,

1. *Categorical*, when the major has for all its members either a common *subject* or a common *predicate*, and the dilemma is in that case called *simple* ;

2. *Disjunctive*, when the members of the *major* have a plurality of both *subjects* and *predicates*.

The following are abstract forms of dilemmas :

*If A be, either B or C is,
But neither B nor C is, (1)
Therefore A is not.*

*If B be, A is, if C be, A is,
But either B or C is, (2)
Therefore A is.*

*If A be, B is, if C be, D is,
But neither B nor D is, (3)
Therefore neither A nor C is.*

(1) and (2) are *simple* forms, (3) is *complex*.

If a dilemma be of such a form as,

*If A be, either B or C is,
But A is,
Therefore either B or C is,*

the concrete gives room for sophistry, as the major may be apparently but not really true, i.e. *If A be, either B is or C is*, may be false, the true proposition being, *If A be, either B, or C, or D, or Etc. is*, hence the frequent use of the dilemma in sophistical reasoning. Example; the Caliph Omar said :

*If the books in the Alexandrine library be in conformity with
the doctrines of the Koran, there is no need of them, if
they are adverse to them they should be destroyed,
But they are either conformable to the doctrines of the Koran
or adverse to them
Therefore in either case let them be destroyed.*

The alternative here is not exhaustive, for the books might not treat of religious matters, and therefore not be conformable to the doctrines of the Koran in the sense in which there would be no need of them; and yet they would not be adverse to its doctrines, so that there was no reason for their destruction.

From the nature of the propositions which form the premises of a *dilemma* it is clear that it must be at once subject to the rules for *hypothetical* and for *disjunctive* syllogisms, but from the variety of which its parts may consist it is impossible to lay down a general abstract formula for it, or to give general rules for its formation. It is an easier task to give rules to enable us to discover when and how a *dilemma* is false. The general rules are a *dilemma* is vicious,

1. When the major is invalid by reason of a false division, i. e. when all the alternatives are not stated. In this case the *dilemma* is refuted by stating the alternative, or alternatives that have been omitted; or, as it is technically called, *dando medium*.

2. When the *minor* is invalid. It contains in its most simple form two categorical propositions, and it may contain more; if any of these be incapable of proof it is invalid.

3. When the *conclusion* can be *retorted*; i. e. when a *contradictory conclusion* can be drawn from the same premises. This shews that there is a fault in the premises, which will fall under one or other of the previous rules. Sir

William Hamilton's rules for sifting a dilemma* are, 'We ought to look closely at the following particulars, 1, Whether a veritable consequence subsists between the antecedent and consequent of the supposition' (*major premise*); '2. Whether the opposition in the consequent is thoroughgoing and valid; and, 3, Whether in the subsumption' (*minor premise*) 'the disjunctive members are legitimately sublated. For the example of a dilemma which violates these conditions, take the following:—

*If virtue were a habit worth acquiring, it must insure either
power, or wealth, or honour, or pleasure;
But virtue insures none of these;
Therefore, virtue is not a habit worth acquiring.*

'Here,—1. The inference in general is invalid; for a thing may be worth acquiring though it does not secure any of those advantages enumerated. 2. The disjunction is incomplete; for there are other goods which virtue insures, though it may not insure those here opposed. 3. The subsumption is also vicious; for virtue has frequently obtained for its possessors the very advantages here denied.'

It is, on the whole, simpler to use the rules

* Lect, on Log., V. 1, p. 352.

we have previously given: 1. The *major* is *inadequate*; for a habit may be worth acquiring though it insures neither power, nor wealth, nor honour, nor pleasure; for it may insure other goods equally or more desirable. 2. The *minor* is *invalid*; for virtue has insured to its possessor, sometimes power, sometimes wealth, sometimes honour, sometimes pleasure.

The name *Enthymeme* is commonly given to a syllogism of which only one premise and the conclusion are stated; the other premise being left, as it were, in the mind (ἐν θυμῷ) of the enouncer. It is either of the form

• *P is M (or M is P)*
 Therefore, S is P,

or

S is M (or M is S),
 Therefore, S is P.

It is more generally of the latter form, the *major premise* being suppressed; for that proposition is more usually a general and universally recognised truth than the *minor*. Of whichever form it may be, however, the complete syllogism is easily constructed, as we have all the three terms in the two given

propositions. Thus in the concrete, if we take

*All great philosophers deserve the admiration of posterity,
Therefore Aristotle deserves the admiration of posterity.*

Aristotle, the *subject* of the *conclusion* (the *minor term*), does not occur in the given premise, but, *deserves the admiration of posterity*, which is the predicate of the conclusion (the *major term*), does, therefore it is the *major* premise which is given. The *minor* will consist of the *minor term*, *Aristotle*, and the remaining term of the given premise (which must be the *middle term*), *great philosopher*, and will be, *Aristotle was a great philosopher*; and the complete syllogism is—

*All great philosophers deserve the admiration of posterity,
Aristotle was a great philosopher,
Aristotle deserves the admiration of posterity.*

Similarly in the *Enthymeme*—

*Aristotle was a great philosopher,
Therefore Aristotle deserves the admiration of posterity,*

we can find that it is the *minor* premise that is given, and that the syllogism is when completed,

*All great philosophers deserve the admiration of posterity,
Aristotle was a great philosopher,
Aristotle deserves the admiration of posterity.*

It is easily seen that—

1. When the *major* premise is given, if the term which is not repeated in the *conclusion*, i. e. the *middle* term, be the *subject*, the complete syllogism is drawn in the first or third figure; if it be the *predicate*, the syllogism is drawn in the second or fourth.

2. When the *minor* premise is given, if the *middle* term be the *subject*, the syllogism is drawn in the third or fourth; if it be the *predicate*, the syllogism is drawn in the first or second.

The *Enthymeme* is the most common practical form of the syllogism.

If we take the syllogisms,

<i>A is B,</i>	<i>A is C,</i>
<i>B is C,</i>	<i>C is D,</i>
<i>A is C;</i>	<i>A is D;</i>

and, suppressing the conclusion of the first, put the two under the form of a syllogism with three premises, we have,

A is B,
B is C,
C is D,
A is D.

Let us now take a third syllogism, having

the conclusion of this last for its *major* premise,

A is D,
D is E,
A is E;

adding it in like manner, we have—

A is B,
B is C,
C is D,
D is E,
A is E.

We can thus add any number of syllogisms, and obtain a general form,

A is B,
B is C,
C is D,
ℰc. ℰc.
X is Y,
A is Y.

This compound syllogism is called a *Sorites* (from *σωρός*, a *heap*). In it all the terms except the first and last are middle, as will be seen from the principle of its formation, and it is resolvable into as many syllogisms as there are middle terms, by supplying the suppressed conclusions, and employing the conclusion of each syllogism as the major term of the succeeding one. The *Sorites* has some

little use in practice, but is too simple in theory to require further remark. The following is a concrete example:—

*He who is good is truly wise,
He who is truly wise is contented,
He who is contented is happy,
He who is happy is blest,
He who is blest is to be envied,
He who is good is to be envied.*

A Sorites may be drawn in comprehension, •
thus,

*X is Y,
W is X,
E.c. E.c.
B is C,
A is B,
A is Y.*

It is then called the Goclenian Sorites, from Goclenius, who first employed it.

A Sorites may be hypothetical; it is of the form,

*If A be, B is;
If B be, C is;
If C be, D is;
But D is not,
Therefore A is not.*

Sometimes, when it has only one conclusion suppressed, erroneously called a hypothetical syllogism, with two hypothetical premises.

The syllogism

*If A be, B is ;
If B be, D is ;
Therefore if A be, D is—*

is not *hypothetical*, properly so called. The premises and conclusions are all *hypothetical* propositions, it is true, but the reasoning has no more to do with the condition which is the essence of the hypothesis, than if the syllogism were of the form

*B is D,
A is B,
A is D.*

We have said nothing of syllogisms having a compound proposition as one premise, as they scarcely require notice. A compound proposition, can always be resolved, as we have shown, into simple elements, and when it forms a premise in a syllogism, that syllogism can be resolved into as many simple syllogisms as there are elements in the compound premise ; thus—

*A is X and Y and Z,
D is A,
D is X and Y and Z,*

becomes

<i>A is X,</i>	<i>A is Y,</i>	<i>A is Z,</i>
<i>D is A,</i>	<i>D is A,</i>	<i>D is A,</i>
<i>D is X.</i>	<i>D is Y.</i>	<i>D is Z.</i>

There is a form of the syllogism where there is no subject or predicate in any of the three propositions ; thus, in the abstract,

<i>A and B are one,</i>	<i>A and B are one,</i>
<i>B and C are one,</i>	<i>B and C are not one,</i>
<i>A and C are one,</i>	<i>A and C are not one ;</i>

in the concrete,

*Chloride of sodium and common salt are the same,
Chloride of sodium and chloride of calcium are not the same.
Common salt and chloride of calcium are not the same.*

It is plain that it can only be employed in cases of *perfect identity*, *perfect resemblance*, *total dissimilarity*, &c., or in what Sir William Hamilton would call '*toto-total coinclusions*,' and '*toto-total coexclusions*.' He calls it the '*unfigured syllogism*;' a better name would be the '*disfigured syllogism*,' which it in reality is.

CHAPTER VII.

COMPARISON OF INDUCTION AND DEDUCTION.

HAVING now considered the science of Reasoning from its earliest stage to its complete development in the syllogism, we shall shortly consider the two different sources from which premises, or grounds of reasoning, may be taken, and the two different lines which are followed in arriving at a conclusion.

We have seen that syllogisms may be drawn either in *extension* or *comprehension*, either in *denotation* or *connotation*; that we may either say *all men are mortal*, and *John is a man*, and thence infer that, *John is mortal*, or we may say, *John is a man and men are mortal*, and so infer that, *John is mortal*. In the former we say that, *men*, are included in the *genus, mortal*; that, *John*, is included in the *species subalterna, man*, of which he is an *individual*, and therefore that he is *à fortiori*

included in the *genus, mortal*. In the latter we assert that, *John*, connotes the general term, *man*; that, *man*, connotes the still more general term, *mortal*; and therefore that, *John*, must connote the term, *mortal*, also. Supposing, however, that we know nothing of the connotation of the term, *mortal*, by the term, *man*—and *à priori* we cannot know it—but, that by observation on all the individuals of the species who have hitherto existed, we have found that not only did they, as individuals, connote the term, *man*, but also that they connoted the term, *mortal*; we should argue—

John, James, &c., were mortal;
But John, James, &c., were all men;
Therefore all men are mortal.

We should thus prove a general proposition, which would combine the result of all our detailed observations as to the mortality of individuals, and which we use as a sign for that result whenever it may be necessary for us to adduce it. A *general proposition* bears the same relation to the *particulars* by which it is proved, or, in other words, from which it is generalized, as a *general term* such as, *horse*,

does to the *singular concepts* of all the individual animals of that species which we have seen or heard of. The syllogism which proves a *general* proposition from *particulars* is called an *inductive* syllogism, while that which proves a *particular* or a *less general* proposition from a more general is called a *deductive syllogism* and the two processes of reasoning, from the *particular* to the *general*, and from the *general* to the *particular*, are respectively called *Induction* and *Deduction*. They are not two *kinds* of reasoning, nor are the principles on which they are based two *kinds* of Logic; it is the same faculty of reasoning applied in different directions; they are the same logical principles applied to different cases. The abstract formula for deduction is, in the first figure, and in the simplest and most natural mood—

All A is B,
All C is A,
All C is B—

while the abstract formula for induction is

C, D, E, F, &c., are B;
But C, D, E, F, &c., are all A;
Therefore A is B.

Now it is obvious that while, in the former

syllogism, the *dictum de omni*, 'Whatever is true of a logical whole is true of all its parts,' underlies and bases the whole syllogism, it is inapplicable to the second, which must have some other foundation for the truth of its consequence. Such a foundation is plainly the converse of the other, 'Whatever can be affirmed or denied of all the individual parts of a logical whole can be affirmed or denied of that whole as a whole. This, then, is the groundwork of Inductive Reasoning. In so far as the science of Logic goes, this is sufficient; but in applied Logic—when the principle of science becomes a rule of art—we shall find a difficulty in the way of forming the *minor* premise of an inductive syllogism. It is seldom that human knowledge can know all the individuals of a species in those branches of knowledge in which Induction is most frequently, nay almost entirely, applied, and in which its use is of absolute and paramount importance. How, then, can we assert that, *C, D, E, F, &c., are all A?* It is impossible that we can do so strictly; and we must assume as a principle of *practical* induction that,

1 'When the number of our observed par-

particulars includes all known individuals of the species, or species of the genus, and when that number is sufficiently great to lead us reasonably to suppose that the connoted term (B) was not *accidentally* connected with any, or all, of the observed particulars, we are warranted in assuming that our observations are as good as though we had really observed *all* the individuals, or species, which are denoted by the species or genus.'

It is common to oppose the two processes of Induction and Deduction, and the latter is even called by some the Ancient Logic, and the former the Modern ; and for these appellations there is a certain reason ; but in truth the two processes must have co-existed from the creation of the human intellect, at least ; and in practice the former must even have had the priority, for particulars must have been observed before general propositions could be formed, as particular concepts must have existed before general concepts were framed in the understanding.

In the earlier ages of human knowledge the Inductive Sciences were feeble in their growth ; the means of observation were inadequate ;

method of observation was unknown ; and knowledge, from the want of facilities of communication between different countries, but above all from the want of books, and the almost entire limitation of all teaching to oral instruction, depended more on individual talent and energy than we can possibly realize at the present day. What a man learned from his observations generally died with him, or was only communicated to a few, of whom most probably only one or two were capable of transmitting it to others ; and it is not till we come to the later period of Greek philosophy that we begin to find the science of the learned written down, and saved for the benefit of others. General ideas were more easily preserved and transmitted than particular observations, and they consequently became the foundation of that speculative and hypothetical Science which, even in much later days, when other and happier views might have readily revealed themselves, still bore down the human intellect with the weight of authority, and still governed it in its habits of thought. Logic was thus, when first the Science was reduced to order, applied solely to Deduction ;

for any slight notice of the inductive syllogism by the ancients or by the schoolmen is too trifling an exception to invalidate the assertion : and it was not till in later times the spread of knowledge was causing the dim outline of the method of observation to appear, and the errors of faulty Inductions began seriously to be felt, that it was called to rule that other kingdom of its dominions. Thus it comes that the Logic of Deduction is called the *Ancient*, and that of Induction the *Modern* Logic.

The *negative inductive syllogism* has a *disjunctive major*, but is not a *disjunctive syllogism*; it is

Neither C, nor D, nor E, nor &c., are B ;
But C, D, E, and &c., are all A ;
Therefore no A is B.

The *inductive syllogism* must have in the *major* the *predicate* taken in the same intention with respect to all the *subjects* ; that is, it must not have a plurality of *predicates*. Similarly that *predicate* must be taken in the same intention as the *predicate* of the *conclusion*. The subjects of the *minor* must be the same and taken in the same intention as the subjects

of the *major* ; and the *predicate* of the *minor*, or *minor term*, must have the same extension in the *minor* and in the *conclusion*.

The other rules as to the *matter* of the premises and its truth must be referred to applied Logic under the head of 'Evidence.'

We have drawn the *inductive syllogism* in the third figure, but it can be drawn in any of the four by a proper quantification of the terms of the premises. The student will, however, see on trial the force of Sir William Hamilton's results, Nos. 16, 17, and 18, which we gave at p. 124.

CHAPTER VIII.

OF FALLACIES IN* FORM.

THE next subject which we shall consider is a certain class of Fallacies, or false acts of reasoning, to which we are now prepared to apply what we have already learned.

Fallacies have been divided into two classes, *paralogisms* and *sophisms*. There is no difference between these except in the intention of the arguer. When he does not mean to deceive by his *fallacy* it is a *paralogism*; when he uses it with a bad intention it is called a *sophism*. This distinction is thus beyond our scope, and we shall pay no further attention to it, and call both *paralogisms* and *sophisms* alike *fallacies*.

The error in a fallacy may lie, 1st, in the form; 2nd, in the matter; 3rd, in both form and matter.

The conclusion of a syllogism, *correct in both form and matter*, is *true logically* and ob-

jectively ;* that of a syllogism *correct in form*, but *incorrect in matter*, is *true logically*, and *may be objectively true by accident* ; that of a syllogism *incorrect in form*, but *correct in matter*, is *logically false*, but *may be objectively true by accident* ; that of a syllogism *incorrect in both matter and form* is *logically false*, but *may be objectively true by accident*. It is only with fallacies which are such from *formal* errors that we are yet prepared to deal. Until we have studied *Evidence* we cannot investigate their *material* failings.

Now, whether a fallacy be in the form of a categorical syllogism, or of a hypothetical, or other non-categorical, when the error is in the *form* it must be a violation of the laws already laid down when that class of syllogism was discussed. The principal fallacies of this kind violate the rule, that there shall be three and only three terms in a syllogism. It is princi-

* Truth is frequently classed as *moral* and *logical*, the *verax* and the *verum* ; the former when a proposition or syllogism agrees with the judgment of the mind, the latter when it agrees with facts. But we here shall consider a syllogism as true *logically* or *objectively* ; the former when if the premises are true the conclusion is true, and the latter when the conclusion is in agreement with fact.

pally the middle term that is thus attacked, when, by the use of an analogous term, or of another term having a similar sound, or by using a term at one time in one part of its extension and again in another, and the like, we in reality compare the *subject* and the *predicate* with a different term, and so have, not, as is generally said, two *middle* terms, but *no middle term at all*. Such are,

1st, *Homonymia*, or *quibble* ;

2nd, *Amphibolia*, or *ambiguity* ;

3rd, *Fallacy of Composition*, or *division* ; in which a term is employed in the same syllogism at one time collectively and at another time distributively, or the reverse.

4th, *Fallacy of Accent* ; substituting for one term another of a similar sound.

5th, *Fallacy of Figure of Speech* ; using a term at one time in a literal, and at another in a metaphorical, sense.

6th, *A dicta secundum quid ad dictum simpliciter*, or, *a dicto simpliciter ad dictum secundum quid*—either when a term is first employed under a condition and then unconditionally, or *vice versâ*.

Most of these fallacies, when given in simple

examples, are too puerile to merit attention. It is only when fallacies are wrapped up in rhetorical periphrases, or are concealed in a vague, abstruse, and it may be a technical terminology, that they mislead the hearer, or even at times escape the detection of the utterer. The only method of detection is, by clearing away extraneous matter, and, it may be, supplying defective propositions—for most practical Reasoning is in the form of the Enthymeme, or the Sorites—to bring the fallacy to syllogistic form, and then applying the rules, as a mechanic would apply square and plummet, to find where the error lies.

As an instance of a fallacy, we may take the Reasoning of Sir William Hamilton on the inconceivable and impossible, in reference to the fundamental Laws of Thought—the principles of identity, contradiction, and excluded middle:—‘Let us take,’ he says, ‘for example, any of the general objects of our knowledge. Let us take body; or rather, since body as extended is included under extension, let us take extension itself, or space. Now, extension alone will exhibit to us two pairs of contradictory inconceivables, that is, in all, four incom-

prehensibles, but of which, though all are equally unthinkable, and, on the hypothesis in question, all therefore equally impossible, we are compelled by the law of excluded middle, to admit some two as true and necessary.

‘Extension, then, may be viewed either as a whole or as a part; and in each aspect it affords us two incogitable contradictories:—

‘1st. Taking it as a whole : Space, it is evident, must either be limited, that is have an end, a circumference; or unlimited, that is, have no end, no circumference. These are contradictory suppositions; both, therefore, cannot, but one must be true. Now let us try positively to comprehend, positively to conceive, the possibility of either of these two mutually exclusive alternatives. Can we represent or realise in thought extension as absolutely limited? In other words, can we mentally hedge round the whole of space, conceive it absolutely bounded, that is, so that beyond its boundary there is no outlying, no surrounding space? This is impossible. Whatever compass of space we may enclose by any limitation of thought, we shall find that we have no diffi-

culty in transcending those limits. Nay, we shall find that we cannot but transcend them ; for we are unable to think any extent of space except as within a still ulterior space, of which, let us think till the powers of thinking fail, we can never reach the circumference. It is, therefore, impossible for us to think space as a totality, that is, as absolutely bounded, but all-containing. We may, therefore, lay down this first extreme as inconceivable. We cannot think space as limited.'

'Let us now consider its contradictory. Can we comprehend the possibility of infinite or unlimited space ? To suppose this is a direct contradiction in terms ; it is to comprehend the incomprehensible. We think, we conceive, we comprehend a thing only as we think it as within or under something else ; but to do this of the infinite is to think the infinite as finite, which is contradictory and absurd.'

* * * *

'But to return whence we have been carried. It is manifest that we can no more realise the thought or conception of infinite, unbounded, or unlimited space, than we can realise the

conception of a finite or absolutely bounded space. But these two inconceivables are reciprocal contradictories; and if we are unable to comprehend the possibility of either, while, however, on the principle of excluded middle, one or other must be admitted, the hypothesis is manifestly false that proposes the subjective or formal law of reason and consequent as the criterion of real or objective possibility.'

'It is needless to show that the same result is given by the experiment made in extension, considered as a part, as divisible. Here, if we attempt to divide extension in thought, we shall neither, on the one hand, succeed in conceiving the possibility of an absolute minimum of space, that is, a minimum *ex hypothesi* extended, but which cannot be conceived as divisible into parts, nor, on the other, of carrying on this division to infinity. But as there are contradictory opposites, they again afford a similar refutation of the hypothesis in question.'

Now, setting aside the *material* falseness of much of the above, and not only have some philosophers, e. g. Aristotle, believed, but

probably nine hundred and ninety-nine thousandths of mankind always have believed, and do now believe, in the possibility of the existence of a finite yet all-containing space; and without stopping to wonder at the odd way of limiting space as a whole by 'an end or a circumference,' we shall set the argument at once in syllogistic form. It resolves itself into two syllogisms,

By the law of excluded middle one of two contradictories must be true;

- (1) *But the existence of a finite all-containing space, and the existence of an infinite space are contradictories. Therefore one of them must be true, i. e. really exist.*

We cannot form a concept of the actual existence of a finite all-containing space, nor can we form a concept of an infinite space;

- (2) *But one of these must exist; Therefore something must exist of which we cannot form a concept, which is ex hypothesi impossible.*

In these syllogisms it is plain that the terms which are given as contradictories in the (1) are not those given as contradictories in (2). In the former it is the *existences* of the two kinds of spaces which are assumed (and correctly) to be contradictories; in the latter it is

the *existence of the finite all-containing space* of which it is, first, predicated that we cannot form a concept ; but it is not the *existence of*, but the *infinite space itself* of which it is, secondly, affirmed that we cannot form a concept, and therefore the *minor* does not hold with regard to them, as they cannot be opposed and are not contradictories. There are four concepts in the whole—

1. *Of a finite all-containing space ;*
2. *Of the actual possible existence of such a space ;*
3. *Of an infinite and therefore all-containing space ;*
4. *Of the actual possible existence of such a space.*

It is 2nd and 4th which are given as contradictories in the first syllogism ; 2nd and 3rd which are given as contradictories in the second.

Before leaving it we may mention in regard to the matter, that 1. is a concept which we can form ; 2. is a concept which an educated and philosophical mind cannot form, but which the great mass of mankind ever have and probably always will form ; 3. is a concept which we *can* form, *clearly* but *not distinctly* ; it is *clear* because we can give a perfect definition of *infinite space* ; it is not *distinct*,

because we cannot divide *infinite space* logically except by a dichotomy, which does not give distinctness to a concept, and therefore it is said correctly that we cannot *comprehend* infinite space, not that we cannot *conceive* it ;
4. is a concept which every well-educated and philosophic mind can and must form.

We need not waste time in shewing that a similar error underlies the reasoning as to the other pair of contradictories, when extension is considered as a part.

CHAPTER IX.

ON THE SOURCES AND NATURE OF LOGICAL
EVIDENCE.

IN the last chapter we had occasion to speak of truth as of three kinds, these we shall now consider. They are:—1. *Objective truth*; 2. *Moral truth*; 3. *Logical truth*.

A concept or proposition is *objectively true* when it agrees with fact; it is *morally true* when it agrees with the belief of the thinker. Viewed subjectively to the thinker, all moral truth is objective. In fact, as all truth is only known subjectively, it is only by the concurrence of testimony that we can ascertain when a concept or a proposition is objectively true. Were there a thinker entirely isolated from the testimony of other thinkers, and from revelation, there would to him be no distinction whatever between objective and moral truth. He might change the connotation of a concept, or the quality of the copula of a pro-

position, and believe in it, when so changed, as he believed in it before ; but it would not differ from other truth in his estimation, as he would not know that any or every other concept or proposition of his belief might not be similarly liable to change.

The objective truth of a concept or proposition may be of two kinds : 1. *Necessary*, and 2. *Contingent*.* A concept *necessarily* true, is such as the connotation of *heat* by the concept of *fire*. The appearance of *fire* without *heat*, such as *phosphorescence*, does not fulfil our concept of *fire* ; it is impossible that *fire* can exist without *heat*. But we may form a concept of *John* in which *goodness* is connoted, that may be objectively and morally true, but not *necessarily*, only *contingently* true ; for there is no inherent impossibility in *John's* being *bad* instead of *good*, and he would be none the less *John* were he *bad*. In the same way we cannot think of the proposition, *Two and two are four*, as otherwise than true, and that although the numerals are pure abstrac-

* Sir Wm. Hamilton calls necessary truth, the primary truths of intelligence ; and contingent truth, the primary truths of fact.

tions ; while the proposition, *Wellington conquered at Waterloo*, though true, might possibly be false. All *necessary* truth must be *objective* truth, for it is impossible that it can be false, and its contradictory cannot even be *moral* truth. *Contingent* truth is *objectively true*, but may be *morally false*, and its contradictory may be *morally true*.

This leads us to consider the laws by which thought is governed. These are the principles according to which, and according to which alone, we can think ; and looking to the apparent complexity of thought, even logically considered, it seems surprising that the whole is regulated by so few and so simple rules.

The first law is that of *Identity*. This is the principle of all affirmative propositions. It is the principle that, *What is, is what it is*. It is the truth of the enunciation, *A thing is equal to itself*, or, *A concept is the sum of all its connotations, neither more nor less*. It is the principle not of logical, but of mathematical definition, which is *perfect* description.

The second law is that of *Contradiction*. This is merely the complement of the former, the one being inconceivable without the other.

It is the principle that *What is not, is not what is*, or, *What is, is not what it is not*. This is the principle of all negation, and of *ad absurdum* demonstrations in mathematics, and the reduction of syllogisms by contra-position.

A corollary to these is the law of Excluded Middle: *A thing must either be or not be*. This is what we already have seen in *opposition*, *Of two contradictories one must be true*. Sir William Hamilton says,* ‘The law of excluded middle is the principle of disjunctive judgments, that is, of judgments in which a plurality of judgments are contained, and which stand in such a reciprocal relation that the affirmation of one is the denial of the other.’

The fourth law is the *Principle of Sufficient Reason*, or more correctly, the *Principle of Reason and Consequent*, as Leibnitz, who founded his philosophy wholly on this principle and that of *contradiction*, uses the principle of Sufficient Reason not only as a logical law, but as a moral principle. The principle of Reason and Consequent is not the metaphysical doctrine of *Cause and Effect*, but, in so far as there is a logical law of causality in the

* Lect. on Log., V. I, p. 84.

connection of thought, it is included in the law of *Reason and Consequent*. This law may be stated not as a governing law—like the three former—but as a guiding law.

The Evidence of truth is of two kinds, Immediate or Intuitive, and Mediate or Deductive.

Immediate or Intuitive Evidence, *per se*, attests the truth only of the simplest fundamental propositions of our knowledge; for the moment we compare two propositions, and come to a conclusion, our Evidence of it is Mediate or Inductive. The concept of individual existence may be supposed originally to include only one proposition, *I am*, but no human being is able to reason on that concept until it has become complicated by numberless propositions arising from the relations of his existence to the other existences around him. We can only form a hypothetical idea of what it may be, by the supposition of a newly-created human mind with all its powers complete, but a *carte blanche* as to all impressions from within or from without; in which, in other words, there has not yet been a state of mind. The first perception of a sensation by such a mind would give the idea of *existence*

not by the sensation itself, but by evoking a latent idea in the mind ; but it would so far be unaccompanied by any idea of *identity* or of any existence *external* to itself. The perception of a second sensation posterior to the other would, with the aid of Memory, give the idea of identity ; it would shew to the sentient thinking being that he was the same individual who experienced both sensations, and thus his identity, or the concept of his existence coupled with that of his sameness, would be formed. In this, however, there is a new element that he has not derived from his two sensations—the concept of *Time*—the knowledge that one sensation was *prior*, and the other *posterior*. This concept must have been latent in his mind ; it is a necessary concomitant of two successive sensations, but it clearly springs from neither of them, nor from their combination, for it would not have resulted had they been simultaneous.

The concept of an external existence will not arise so immediately, it is the result of the discovery that our sensations are not produced by our volition, that they are independent of our will, and that though felt by us they are the

result of some other existence. The concept of this existence again calls forth another concept latent in the mind, that of *Space*.

Now in such a laying-the-foundation of our knowledge we are evidently supplied with materials from two sources, 1st, *Consciousness*, or that immediate knowledge accompanied with belief which the mind has of all its states ; and 2nd, *Intellection*, or that amount of *à priori* intelligence which must be a part of the original constitution of the mind, as it is impossible that it could be the result of experience.

Consciousness is not itself a source of intelligence, it is only a communicator. Sense and Memory are the real sources of the perceptions and reminiscences with which it acquaints us. One class of psychologists has considered Consciousness to be a separate Intellectual Power, while another holds it to be only a name for the entire sequence of our mental experience. It is but a matter of words, for even in the crucial instance of our necessarily having a sensation of which we were not conscious, the one view holds that the power of Consciousness being fully occupied at the time, or dormant, as the case may be, did not

record or observe the sensation ; the other, that the sensation never was part of our mental experience, was but a mere physical impression on the organs of sense, and never a perception or mental state. With this we have nothing to do ; our object is to see how far we can refer Intuitive Evidence to Consciousness, and whether we can set down the latter absolutely and unconditionally as one of our sources of that Evidence. Now, as Consciousness is the knowledge of *all* our mental states, it evidently gives us more information than we can accept, not merely as Intuitive, but even as Logical, for it reveals to us all our emotions, passions, hopes, &c., which are not connected with the subjects of Logical speculation. We must confine ourselves, therefore, in so far as Intuitive Evidence goes, to two of the sources with which it deals, viz. Sense and Memory ; and even then we shall find that, of the knowledge which they supply, all is not strictly Intuitive.

Intuitive Evidence possesses two characteristic qualifications by which it can be clearly distinguished from Deductive Evidence. It is, 1st, *Instantaneous* : it admits of no delay in

its application ; it comes home at once to the proposition. 2nd, *Imperative* : it admits of no doubt in its application ; it is the proof of the proposition, and of no other, and that proposition has no other proof. As a corollary to these we may add, 3rd, it produces the same effect on all.

Testing the Evidence of Sense by these conditions we shall find that it is only our primary perceptions that can be included in the category of Immediate Evidence. Our secondary perceptions, which are the result of experience, of long and careful deductions ; which are not necessarily instantaneous ; are known to be often fallacious, and are, therefore, not imperative ; and they are universally known not to have the same effect (i. e. produce the same belief) in all. It is only the primary and simplest Evidence of our senses that is Intuitive, and that only so far as it is *distinct*. For instance, when a certain sound is heard, the Evidence is only Intuitive of the fact of hearing it, and of the nature of the sound as sound ; that it is a near sound, or a distant one, the sound of a violin or of a flute, is not known Intuitively from the perception of it ; such knowledge is

the result of deduction, and may be fallacious. But the Evidence of Sense is subject to another condition before it is to be received as true Intuitive Evidence, viz. the organs of Sense must be perfect and free from disease. The Evidence of a Sense, the organ of which is diseased, may be instantaneous and imperative to the individual, but the evidence drawn from the same object by the same sense in individuals whose organs are not in any way impaired by malformation or disease will not be the same; the same effect will not be produced on them as on the individual in question, but the same effect will be produced alike on all but him.

When we speak of the effect produced, we mean the immediate perception of the quality of the object which the sensation gives us, not any deductive inference that the mind may draw from it. Thus, the rustic who sees a ghost in the churchyard, and the philosopher who sees only a boy wrapped in a sheet, see both the same white object, which produces Intuitively the same effect on both, viz. the belief of the presence there of an external object of a white colour. The rustic seeks

no further Evidence, deduces that it is a ghost, and runs away ; the philosopher by looking for further Evidence, both by primary and secondary perceptions, and by building upon it a more correct deduction as to the real nature of the object before him, arrives at the true result. Our Senses seldom deceive us by false Evidence—we frequently deceive ourselves by false deductions based on the Evidence which they afford.

Memory is the Intellectual Power which testifies to the existence of *previous* mental states. It is by some opposed to Consciousness, which is by them called the Power which testifies to the existence of a *present* mental state ; but this is an erroneous proposition, as Memory produces a present mental state—that of *Reminiscence*—of which we are only sensible by the Testimony of Consciousness. Now, Memory can furnish us with none but Intuitive Evidence, and its Evidence so far as it goes is perfect, while the power is unimpaired by age, ill-health, physical injury of the brain, or over-exertion. In these latter cases the Evidence afforded by it is analogous to that of Sense, when the organ is imperfect, or diseased, and

may be fallacious. But even when fallacious the evidence of Memory exercises the same despotic sway on the mind of the thinker as any other Intuitive Evidence, and produces instantaneous and necessary belief, which nothing can subvert, but the Counter-Evidence of Memory itself. A false reminiscence only loses its authority either when its contradictory is directly remembered, or such other reminiscences are evoked as render its truth impossible or absurd.

As to the amount of Evidence which we receive from Memory, we may fitly quote the words of Dr. Whewell;* ‘If Memory be absolutely requisite to connect two events which begin and end a day, and to perceive a tract of time between them, it must be equally indispensable to connect the beginning and the end of a minute or a second; though in this case the effect may be smaller, and consequently more easily overlooked.’

The remaining source of our intuitive evidence is the intellect or Intellection, the *à priori* concepts of certain necessary concomitants of all existence which is not at once

* Phil. of the Induct. Sc. B. II, cap. x, Art. 1.

immaterial and momentary. Our concepts of *Space* and of *Time* cannot be acquired by experience. That of *Number* is by some also reckoned as primary, but it may be clearly seen to owe its origin to experience. The principles of *Identity*, *Contradiction*, and *Reason and Consequent*, must, however, be added to those of *Space* and *Time* as innate in the human intellect. It is by *Identity* that we know that, *a whole is the sum of all its parts*. The axiom itself is not innate, we require experience to inform us what ‘*a whole*’ is, and what ‘*a part*’ is; but knowing *that*, the principle of *Identity* at once gives us the relation between the whole and *all* its parts. The invariable sequence of one event after the occurrence of another would pass unnoticed, had we not within us the concept of *Reason and Consequent*. The concept of *Externality* may be considered as Intuitive: we have no means, it is true, of actually tracing it to its origin; it seems merely the complement of the concept of the existence of self, a complement that is necessarily Intuitive, and which cannot be shown to be deductive, or in any way deduced from Intuitive Evidence. Some go

so far as to consider the axioms of mathematical and moral science to be Intuitive, and they fulfil the conditions of producing belief instantaneous, imperative, and the same in all men; but they are not Immediate, they are built upon a knowledge of terms by the three fundamental laws of thought.

Between the opposite extremes of denying all innate ideas, and of considering a vast host of deductions as springing spontaneously from the fertile soil of the intellect, there is room for many shades of varying opinion. In the study of mind, this subject is beset with the serious difficulty that, by the time that man is able to investigate his thoughts, his early concepts are so increased in their connotation by the never-ending train of Reasoning which has been in operation from his first moment of Consciousness, coupled with the feeble, scarcely-existing power of Memory in the earliest stages of existence, that he can at best give a hypothetical conjecture as to how they originally arose in his mind, or what was the primary form in which they were manifested.

The safest course is only to ascribe to innate ideas those concepts which could not have

had their source in any external evidence, which must have been coeval with our first Consciousness, and which are universally to be met with in all sane human intellects. The concept of *Space*, not as finite or infinite, or in any way discreet, but simply as, *room, in which objects exist*; the concept of *Time*, not as days, or hours, or even seconds, but as *past* and *present* only, as simple succession in which is the duration of existence; the necessity that, *What is, is*; that, *it cannot be what it is not*; and that there is a connection between things that, to our experience, invariably bear the relation of antecedent and consequent, are probably all that we can affirm to be the necessarily innate potentials of thought when the human intellect comes into being.

Mediate, or Deductive, Evidence is of two kinds: 1, Mathematical or Demonstrative; 2, Moral.

All Deduction is founded ultimately on Intuitive Evidence. This is manifest from the very nature of the thing as defined; we cannot prove anything deductively from nothing, and therefore our first Deductions must have been based on Evidence that was not Deductive,

i. e. Intuitive. As the intelligence of the thinker grows in personal knowledge, and as the Deductions which have been made by other thinkers become known to him, he ceases to depend on Intuitive Evidence for his trains of Reasoning. Ultimately, the great bulk of the truths in which he believes, and which form his principles of action, and the practical rules which arise from them, are based on Deductive Evidence. The consideration of it, therefore, though it is not the ultimate foundation of our knowledge, is from its vast practical range of more real importance than that of Intuitive Evidence. It is obvious, from what we have already said, that Deductions based immediately on Intuitive Evidence and correctly drawn must be *objectively* true, except in those cases where the Evidence is vitiated by defects of Sense or Memory ; and when the results of these Deductions themselves become the premises in other correctly drawn Deductions, still the results will be objectively true. Such Deductions, where no propositions which assert only *contingent* truth are admitted as premises, are *Demonstrations*. As all our original Evidence is Intuitive, it may seem

strange how a false proposition, or one only contingently true, should first enter into our train of reasoning. There are only three sources by which it can enter : 1. The fallacy of the evidence of the Senses or Memory through imperfection or disease ; 2. Error in the process of reasoning from intuitive evidence. These two sources of error vitiate not only our own reasonings, but introduce a fallacious element into the testimony of others, which may be further vitiated by the remaining source of error, 3. Wilful falsehood on the part of the witness.

Demonstration is wholly confined to *necessary* truth ; its premises are all necessarily true, and the contradictories of the conclusions drawn are necessarily false. The fundamental premises are either *Axioms*, i. e. propositions which are self-evidently true, or *Constructions*, which are granted, and must be allowed as possible. It is common enough to assert that *Definitions* may be the premises of mathematical reasoning, but this is thoroughly erroneous. A mathematical definition is a complete description of the thing defined ; thus, when we say that ‘ a plane superficies is that in which any two

points being taken, the straight line between them lies wholly in that surface.' We can add no other property to this description of a plane considered simply by itself; it is so effectually complete that no other definition of a *plane* can add anything to our knowledge of it; and therefore, when we use the term *plane superficies*, or *plane*, which the definition has set as a mark for the thing, we are absolutely free from ambiguity or error in its use. But the plane has acquired no qualities *from its definition*, it has only got a *name*, a mark which may be used instead of it; and the whole of geometry could be proved without one single definition, by abolishing the use of names, and employing the descriptions of the things; and by so doing we should get rid of those references to the definitions, which are useful to refresh the Memory with the connotations for which the name stands, but of which the subjects are not properties of the thing *in virtue of the definition*; by so doing, the complication would be excessive, and the labour immense, but the Reasoning and the results would be identically the same.

A demonstration is one single, connected

chain of reasoning in syllogistic form, generally in that of the Enthymeme or the Sorites. It is the perfection of logical argument, and can only have one conclusion ; every step in it is undeniable, and enforces assent ; and the conclusion being *necessarily* true, is valid as a premise in another demonstration.

Moral deduction, or *dialectic*, differs from *Demonstration*, in that it is not always necessarily true ; the axioms on which it is founded do not relate to notions, but to facts ; and the conclusion may not be established by one single chain of evidence, but by several which are totally unconnected except through the common conclusion ; the belief also which it produces may not be absolute, but may vary in degree from moral certainty to bare probability. The Evidence on which it proceeds may spring from, 1. *Experience* ; 2. *Analogy* ; 3. *Testimony*. By *Experience* we mean only the *personal* Experience of the thinker. *General Experience*, that of others, or of all men, falls under the third head of Testimony. The axioms that result from Experience are, *The future will be like the past* ; and, *The same*

causes will, under the same conditions, produce the same effects; and the converse of these, *The past was like the present*; *The same effects have, if the antecedent circumstances were the same, been produced by like causes*. Experience may be fallacious from, 1. *The imperfection of the Senses*; 2. *The imperfection of the Intellectual Powers*; 3. *Deficiency of education*; 4. *Prejudice or preconceived ideas*.

Analogy is founded on *Experience*. It rests on the axioms, *Like causes produce like effects*; and, *Like effects are produced by like causes*. We reason by *Analogy* when we employ the Evidence which we have in a known case to another case where we have not direct Evidence, but which in its *essential* points bears a strong resemblance to the essentials of the former. It is necessary that the points of resemblance should be essential, as two things may resemble one another strongly in accidentals, and yet differ so widely in essentials that *Analogy* would be wholly inapplicable. *Analogy* is principally of use in guiding us in research; it can never give a conclusion that is *morally certain*, but only one that is *pro-*

bable. It may be the means of our arriving at a series of conclusions as to the probability or improbability of the truth of a certain proposition—about which we can have no other knowledge—that from their number and the inherent probability of their individual truth may make us *almost* morally certain one way or the other ; but this is the farthest that it can go.

Testimony is the Evidence of the personal experience of others. It may be *immediate*, or the Evidence of the personal experience of the testifier ; or it may be *mediate*, or the Testimony of Testimony, and as such is liable to infinite variety in its degree of credibility. Testimony varies in credibility, or the probability of its truth, 1. According to the matter of which it is Evidence ; and 2. According to the probability of the truth of the Evidence as Evidence ; or according to the probability of the testifier's capability of giving Evidence that is *logically* true, and the probability of his interest or inclination to testify what is *morally* true.

With regard to the matter of Testimony it

may be classed as, 1. Probable, or likely ; 2. Extraordinary, where the probability is slight ; 3. Marvellous, where it is both extraordinary and unprecedented, and therefore improbable. In all these cases, its truth is possible, but the enquiry as to the truth of the Evidence as Evidence must be more searching as the improbability increases. The matter of Testimony admits of another division into *Human* and *Divine*, and the latter falls entirely under the head of Marvellous.

A witness may be incapacitated from giving Evidence that is logically true, from any of the causes which may render his personal experience fallacious ; these we have already enumerated. He may testify that which is not morally true from interested motives, where his true Testimony would produce injury to him or his, or where it would deprive him or them of some expected advantage ; or he may give false Evidence purely from a wish to deceive, or a habit of lying.

The actual application of these rules for sifting Evidence, and finally stamping it for what it is worth, is so infinitely varied by the

circumstances of each individual concrete Deduction, that it must be left entirely to individual judgment; for even before we come to that, the various Moral Sciences have still more minute and special rules for the application of these more general laws. We shall have to review them again in a subsequent chapter.

CHAPTER X.

OF INDUCTIVE METHOD.

THERE must be some plan, it is clear, to enable us to draw our Inductions in such form as to produce a result. It would be but an idle waste of time to observe particulars and store up observations unless we had some means of arranging them with a view to an end. We must have some guide to go by, some idea to work out; in other words, the necessary preliminary to an Induction is an *Hypothesis*.

The ancient Philosophy built upon Hypotheses, the modern builds for them. The Hypothesis often springs from the observations of a single fact, as Newton first thought of the principle of gravitation from seeing the apple fall; but it may be a pure conjecture based on no observed phenomenon. An Hypothesis may be false in itself, and yet serve as the framework on which to build up much

that is really true ; the Hypothesis that there exists a special form of matter, called *luminiferous ether*, may be unnecessary and false—probably is so, if we consider that the existence around the earth of a gaseous atmosphere, which is capable of infinite dilatation, implies that *it* pervades all space, and gives as good a luminiferous medium as any *ether* that we can suppose made solely for the purpose—yet the undulatory theory of light may be built on the Hypothesis, and will not be one whit the less true if the latter be discarded.

An Hypothesis, also, may be *Simple* or *Complex*. It is *Simple* when its truth or falsity is ascertained immediately from a series of observations of particulars ; *Complex*, when its truth is ascertained by the proof of certain simple Hypotheses which are its constituent members, and which must all be true in order to its truth. Generally in every Inductive Science the Hypothesis is Complex. We do not reason at once from the observation of particular facts to the most general propositions. We prove a certain number of propositions from observation, and as these propositions accumulate we arrange them according to their nature,

and again induce from them propositions of a higher order of generalization, and so on, until we reach, it may be, the most general proposition in the Science we are investigating. If our Inductions are correct, and so we have discovered the true principles of that Science, we can then use deduction to explain all its phenomena that may afterwards be submitted to us. In general terms, it is by Induction that we acquire our knowledge ; it is by Deduction that we use it.

Our Inductions are seldom if ever perfect. We can in the abstract formula predicate that, *B and C and D, &c., are Z*, but we cannot in most cases say that, *B, and C, and D, &c., are all A*. The furthest we can generally go is that, *B, and C, and D, &c., are all known A*; and the best proof of the truth of an Induction is when *L*, or *M*, which was previously unknown, appears, and does not alter the conclusion, *All A is Z*. Usually we must employ the *dictum*, *That when all the known particulars are cited, and are numerous, they are as good as all the particulars known and unknown*. In some cases we can give *all* the particulars. Let us see what Mr. Mill says on such a

case :*—‘ A second process, which requires to be distinguished from induction, is one to which mathematicians sometimes give that name, and which so far resembles induction properly so called, that the propositions it leads to are really general propositions. For example, when we have proved with respect to the circle that a straight line cannot meet it in more than two points, and when the same thing has been successively proved in the ellipse, the parabola, and the hyperbola, it may be laid down as an universal property of the sections of the cone. In this example there is no induction, because there is no inference : the conclusion is a mere summing up of what was asserted in the various propositions from which it is drawn.’ In what else does Mr. Mill suppose that an inductive inference consists ? His reasoning is the parallel to the absurd objections against the syllogism, viz. that syllogistic reasoning is always reasoning in a circle, because the conclusion is always contained in the premises. Few logicians would admit a conclusion that was not.

Mr. Mill also attempts a short road to practi-

* Logic, B. III, c. ii, § 2.

cal reasoning, though he does not at first make it quite clear whether he considers it inductive or deductive. 'Not-only,' he says,* 'may we reason from particulars to particulars, without passing through generals, but we perpetually do so reason. All our earliest inferences are of this nature. From the first dawn of intelligence we draw inferences, but years elapse before we learn the use of general language. The child, who, having burnt his fingers, avoids to thrust them again into the fire, has reasoned or inferred, though he has never thought of the general maxim, Fire burns. He knows from memory that he has been burnt, and on this evidence believes, when he sees the candle, that if he puts his finger into the flame of it, he will be burnt again. He believes this in every case which happens to arise; but without looking, in each instance, beyond the present case. He is not generalizing; he is inferring a particular from particulars. In the same way also brutes reason. There is little or no ground for attributing to any of the lower animals the use of conventional signs, without which general propositions

* Logic, B. III, c. iii, § 3.

are impossible. But those animals profit by experience, and avoid what they have found to cause them pain, in the same manner, though not always with the same skill, as a human creature. Not only the burnt child, but the burnt dog, dreads the fire.' We should be inclined to say that if the child did not draw a general inference when he was once burnt by a candle, he stood a very fair chance of being burnt a second time; and if children are very young, and have not learned the axioms of experience, *That the same cause will under the same circumstances produce the same effect*, and *vice versâ*, they do repeat the process of burning their fingers when they get an opportunity. It is an unwarrantable assumption that the use of general language, as of conventional signs, is necessary to the formation of general ideas. They are unquestionably formed in the mind long before the power of speaking or of understanding speech has been attained, and as unquestionably they are formed in the minds of many animals. Mr. Mill says that the child believes in the evidence that memory affords him that he has been burnt, 'and on this evidence believes,

when he sees a candle, that if he puts his finger into the flame of it he will be burnt again.' But what is the evidence supplied by Memory? The former presence of the candle and the former burn alone? From nothing more than *Memory* and the facts: he can have no idea of any connection between the two events, but that of antecedence and consequence in point of time. The very knowledge that it was the candle that burnt him involves the general idea of causation, and this idea as applied to that instance is remembered along with the events. The burnt dog profits by 'experience;' but what is experience if it be not founded on a general idea? Mr. Mill says elsewhere that 'without language, or something equivalent to it, there could only be as much of reasoning from experience as can take place without the aid of general propositions.' Can Mr. Mill, or can any one else, define, *Experience which does not require general propositions*? It is true that both the child and the dog reason 'from particulars to particulars,' but not immediately. They do not express the general propositions which they employ at full length any more than logicians of greater experience,

and who can command the use of general language or conventional signs, are in the habit of doing ; still the general propositions must exist as ideas, or the child and the dog would act like the moth, which consummates its 'incrimination in spite of all its particular warnings. All these reasonings are either founded on experience, or on analogy based on experience, the axioms of which we have previously given. Mr. Mill afterwards says, when alluding again to the reasoning from particular to particular, ' And this inference of one particular fact from another is a case of Induction. It is of this sort of Induction that brutes are capable.' Elsewhere, Mr. Mill claims a power of settling the meaning of his terms, much the same as that which the captain of a man-of-war has of 'making twelve o'clock;' and so this may be 'a sort of Induction' in his logic. It certainly is not so in the general acceptance of the term.

In an Induction we are reasoning in comprehension—we are from a series of particulars taking out what we find to be their common connotation ; to this common connotation we set a name ; this is the name of a *species*

specialissima or *infima*; and having got several of these *species*, we again take out *their* common connotation, and set a name to it, which is the name of their *genus proximum*. In the same way we find other *genera* if required, until we come to the *sumum genus* of our classification. In using the terms *species* and *genus*, we are not speaking merely of *names*, but generally of *facts*, the latter being as amenable to the predicables as the former. When a number of facts are very distinctly marked by the possession of one or more common qualities, not generally experienced, the mind readily perceives this similarity, and connects them by this common tie. This is called by Dr. Whewell, the ‘Colligation of Facts.’ When facts, whose common relations are not obviously apparent at first, suddenly meet in the same *species* in our classification, they tend much to strengthen our opinion of its correctness, and lead us to advance more rapidly to the next stage of it. This is termed the ‘Consilience of facts.’

The facts on which we are founding an Induction may not be presented to us simply as affected by the law or cause which we are

striving to determine. They may be subject to the simultaneous operation of other laws or causes ; and it is a matter sometimes of great difficulty and care so to select our facts, and so to observe them, as to eliminate as much as possible the operation of all the laws or causes except that which we wish to determine. In Moral Science there is no given method for this, and ingenuity must supply one adapted to the circumstances of the case. In Physical Science there are three methods enumerated by Dr. Whewell, which are of common and very general application: 1. The method of curves; 2. The method of differences; and 3. The method of least squares. For an account of these and of their application, as belonging more to the Philosophy of Science than to the Science of Logic, we refer the reader to his most valuable work, ‘The Philosophy of the Inductive Sciences.’

CHAPTER XI.

OF LOGICAL METHOD IN GENERAL.

LET us now trace by what processes of Reasoning we gain our knowledge, either as individuals, or as mankind; how we acquire, each of us, our personal and peculiar knowledge, together with our share of the common stock, and how that common stock, which is all Human Science, is gradually extended.

Beginning at the very foundation of our personal knowledge, it seems as if the bare fact of existence were revealed to us immediately on the perception by the mind of our first bodily sensations—by our first mental state; and that, as soon as Memory has sufficient power to remember one perception till we have the next, we have awakened within us the ideas of time, and of our identity—the first real feeling of *our own* existence. All things of which we have perceptions must

still, however, be supposed to exist within ourselves; it is not until we have learned the power of volition, and found that something obeys it, and something does not—that what obeys it is in us and of us, and that what does not obey it is not in ourselves, is a separate and unconnected existence—that we have developed in our minds the knowledge of an external world. These are the first steps in our career of knowledge; and though their acquirement is so obscure that none but an hypothetical account of it can be given, it seems difficult to find one more consistent, or more probable, than that which we have stated. There is no Reasoning, deductive or inductive, in the two first of these steps; there is clearly nothing but the wakening up of the dormant ideas of Existence, Time, and Identity in the mind; and it is the most reasonable course to suppose that the idea of Externality is also innate. It is true that we find by experience that, while one occurrence is the result of our volition, another is independent of it, and so may *reason* that the former is referred to our own existence, the latter to another existence external to our own; but

this is explaining how we use the idea of externality, not how we acquire it. Why should there not be a part of our own existence not subject to our volition? Nothing can answer the question, as it is first answered to us, but the idea of externality; it is that alone that enforces on our belief the broadly general propositions, *I am what I will; that which I cannot will I am not*. No doubt there is much in our physical existence, and there are many mental states produced by it, all of which are in us and of us, that are not subject to our control, and are not originated by our will; but these are later ideas on the subject, and presuppose a widely increased knowledge for their comprehension.

Starting from this point, our knowledge at first is chiefly gained by Induction. The inductive processes are necessarily extremely defective, and the conclusions are frequently erroneous, and they are mixed throughout with Deductions, in which the axiom of experience, given by the law of reason and consequent, *The same cause will under similar circumstances produce a similar effect*, plays the part of major premise. By and by, when

our store of general propositions increases, we apply them more widely in Deductions, which serve as guides to our practice, while they test the truth of their own premises; and at the same time we enlarge the bases of our Inductions, confirming, correcting, or destroying our previous conclusions; and having had inductive proof of the general truth of the testimony of those around us, we speedily commence to receive from them large additions to our stock of ideas—we begin our education. Thus individually we gain our knowledge.

The knowledge which is common to all mankind is, all Human Science, while the universal practice of mankind is, all Human Art, the rules of which are applications of the principles of Human Science.

The whole of Human Science may be classed into two great general divisions—I. Subjective; II. Objective. The first division comprises those Sciences which treat of the various relations of man simply as a created being, and as related to other created beings. The second comprises those which investigate the principles of all existences as objects; the nature and existence of a Supreme Being; the intel-

lect of man, the results of its exercise ; and the whole range of physical creation, animate and inanimate.

The subdivisions of Physical Science are undergoing endless modifications, partly from the fact that they are as yet but partially developed, either as a whole or as individual sciences ; and partly, because every writer on the subject, viewing them from his individual point of view, is inclined to vary the bases of classification ; and thus groups which are formed to-day are dispersed and re-grouped to-morrow.

But without descending into very minute subdivisions, or attempting to carry out the application of a method which we only wish to indicate, we may give the following scheme, in which the principal Physical Sciences of inanimate nature are classed as co-ordinate, not because they really are so, but because it would be far beyond our present scope to trace their mutual relations and dependence. To show how the general name *Mechanical Science*, or *Mechanics*, should extend over *Statics*, *Kinematics*, *Astronomy*, *Hydrostatics*, *Optics*, &c. ; how *Chemistry* is bound to *Mechanics* by *Electricity*

through the principle of *Polarity*, and to *Mineralogy* by *Crystallography* and the principle of *Symmetry*, and so on through every connecting link of the mysterious chain, is no part of Logic.

On considering the Sciences laid down in the scheme, it will be seen that some, such as Religion, Theology, &c., do not owe their origin to an extended system of experimental research; that the few facts on which they are based are such as are easily ascertained and must be generally known; and that they owe their development more to deductive than to inductive Reasoning. The greater part of any of these Sciences deals more with the first general ideas as the foundation of its Reasoning than with the formation of these ideas. It is true that to a certain extent Induction lies at the basis of every Science, that no axiom can be formed without it; for every generalization is an Induction: but it is lost to view in the subsequent and apparently more important part of the research, and the Science is called *Deductive*. Other Sciences, again, depend for their real and true existence as Sciences on large and comprehensive schemes of systematic

observation ; the facts on which they are based are so numerous, and it may be so involved, that it requires the patient labour not of one, but of numerous, observers for very lengthened periods of time to complete the processes by which a single generalization is ultimately proved. In these, again, Deduction may take the general propositions so acquired, and applying them to yet uninvestigated phenomena, add the explanation of them to the store of our knowledge ; or it may draw from the general propositions conclusions that may lead to the discovery of new and important facts ; but the preliminary Induction has been so pre-eminently important, that it stamps the Science with its name, and it is called an *Inductive Science*. All the Physical Sciences are pre-eminently *Inductive*.

Again, as the sciences that are now Deductive must in all probability have, in the earliest ages of human knowledge, taken *some* time for the observation of their bases, and the production of the generalizations on which they now rest, they would, during that time, be Inductive Sciences, and have thus changed their character in respect of the reasoning employed

in them. So likewise during those periods of the history of mankind that were unfavourable for experimental research, and its development by successive observation, such of the Inductive Sciences as had already attracted attention were Deductive, and confined to reasoning on generalisations from a limited number of facts of common experience; and these facts being laid down as true, the fabric of the science was based on them, and any others that might subsequently be observed which did not agree with the previous Deductions were either reconciled with them by the invention of some special law, or set down as anomalies—exceptions which proved the rule. One of these cases of change from Induction to Deduction which comes to our own time, is that of Social Science, where certain general ideas have been forced to submit to the test of experimental investigation, and the Sub-Science of Statistics is now, and will long be prosecuting the enquiry. It is quite possible that a Science, which is Inductive at the present time, may yet arrive at a point when the facts will be completely investigated, and it will be for the future a Deductive Science.

It was, as we have elsewhere mentioned, the increased facility of communication among the observers of all nations ; and above all, the immense advantages for the recording and the transmission of knowledge which the art of printing conferred upon mankind, that opened the way for general and systematic observation, and enabled one generation to avail itself of the labours of its predecessors, and thus stimulated Induction into an activity of life that almost seemed a new creation.* For a time it was almost unnoticed by philosophy ; by degrees it began to affect the system of scientific research ; it was dimly recognised by some of the more advanced intellects ; and was at length fully developed by Francis Bacon, whose acute mind unveiled its principles, while his powerful genius did the work of generations of ordinary men in explaining and regulating its application. It is too much the fashion to consider that though he did the first well, he failed in the second ; an attentive consideration of what he did with the means at his command, gives

* See on this subject Whewell's *Phil. of the Inductive Sciences*, Book XII.

a very different idea of his merits in this respect. He developed—we may almost say he discovered—the Logic of Induction; he showed its use, and more than its use, its absolute necessity in all the investigations of natural phenomena. He inveighed against the Aristotelian Logic of Deduction, and the Scholastic Philosophy of bootless disputations, not altogether as things absolutely worthless in themselves, but as worthless for much of what they pretended to do. He showed that to penetrate the secrets of nature we want real knowledge, not empirical philosophy; that Reason must explore Nature, and not attempt to coerce her to obey its arbitrary dictates. But he did not, he could not create Inductive Science. When he came to exemplify the working of the method he promulgated, he had to use the materials that were to be had; he was neither a prophet nor a magician, and we can only realise his position, and estimate the value of his work, when we put ourselves in his place, surround ourselves with those *Idola Fori* and *Idola Theatri* that beset him, and then consider, who under the circumstances would have done so much, and done it so

ably as he did? It has taken nearly three centuries* of labour on that way which he pointed out, to enable us to journey so far as we have done in the domain of real knowledge, and we cannot wonder that he who first showed the entrance to a path so rugged, and that had to be hewn out with so much toil, could himself advance very far along it. He was the engineer, not the contractor; and if he turned the first sod somewhat unskilfully, we must remember that the undertaking was new in kind, not simply in degree; that the requirements of the labour had not yet taught him the construction of the fitting tools for its performance, nor had practice conferred skill in the management of those at his command. Had Bacon never lived, still the Inductive Method would have been in time developed; it might have been by the labours of successive toil, or by one other single mind, but then it must have been that of another Bacon. He gave an impetus to philosophical inquiry that will ever remain the great starting-point of human discovery, and shed a lustre on his

* The *Instauratio Magna* was published in 1605, the *Novum Organon* in 1620.

name that makes men forget at once his other merits and his lamentable defects.

Bacon in his *Novum Organon* first treats of those impediments to the investigation of truth, which hinder the mind from a successful search for Evidence, or a correct estimation of it when obtained. These impediments he calls *Idola* — Idols, objects of superstitious veneration, not of true reverence—and he divides them into two classes: 1. *Natural*, and 2. *Artificial*. The first of these, which are inherent in the Human Mind, as finite, imperfect, and defective in its powers of observation through the senses, he subdivides into two classes: 1. *Idola Tribus*, and 2. *Idola Specus*. The second are the hindrances to the mind from its communications with the world around it, and are divided by him into 1. *Idola Fori*, and 2. *Idola Theatri*. Leaving out any consideration of the bipartite division into Natural and Artificial, we shall shortly consider the four classes into which they are thus divided.

And 1. The *Idola Tribus*, or Idols of the Tribe, are those errors which man is liable to from his nature as man.

This class Bacon divides into seven species :—

1. Those arising from a supposition of a degree of uniformity in nature greater than that which really exists. To this class may be referred the whole tribe of omens, dreams, lucky days, &c. : all of which, if properly investigated, will be found to rest on mere casual coincidences ; the supposed sign of ill-luck often occurring without its attendant misfortune, while the latter is still oftener unheralded by the sign ; as thousands die in peace, undisturbed by the tick of the harmless deathwatch.

2. Prejudices ; those prepossessions which generally have laid hold of the mind in early years, and which it is always difficult, and sometimes impossible, to lay aside. The subjective, and the two first divisions of the Objective Sciences, are those principally affected by prejudices. In the Moral Sciences, the precept and example of those around us in our youth bind our inclinations, and influence our mind through the whole course of our lives. In the others, the authors we have first read, or the masters we have

first studied under, tend to produce a like effect. And, now that we know more of the world and of man than Bacon did, we can but wonder more and more at the prodigious influence that prejudice has upon the most enlightened opinion.

3. Those Idols which have their origin in the facility with which the mind is carried away by the imagination. When men have found an hypothesis, they follow it up rashly, without duly weighing evidence, being naturally borne away by the sanguine element in their temperament; and the young are more obviously liable to worship these Idols than the older and more calm and experienced.

4. Idols which spring from the restless activity of the mind—its desire to be able to account for more than it really knows, and its tendency, on that account, to form and reason upon untenable hypotheses, as though they were established theories.

5. Idols that arise from the influence which the will and desires have upon our understanding. Men believe what they wish, though supported by but few and feeble facts, and more than the due weight of evi-

dence is often necessary to make them believe what they would rather not credit.

6. The Idols which have their origin in the fallacy and incompetency of the senses, and which were believed by Bacon to form one of the common and obstinate classes of impediments in the way of the experimental philosopher. He does not by any means hold the Cartesian doctrine, afterwards so powerful in the world of philosophy, that our senses are always to be doubted, and nothing can be considered to exist but that which can be proved by a process of logical reasoning ; but only that, in many cases, we trust to a single experiment or two, it may be of a single sense, for information on points which can only be known correctly by many experiments with several of them.

7. The last variety of the *Idola Tribus* arise from the tendency of the human mind to hasty generalisations—to form an Induction on inadequate premises. No doubt, in Bacon's time these Idols were bad enough ; but nowadays, when a little knowledge is pretty generally diffused, and a great deal required of the recipients of so little, the temptation

is greater to form hasty general opinions, which can be speciously put forward when required, and stand a fair chance, even though they be wrong, of not being detected * by those that hear them.

We come now to the second general division of the Idols, viz. *Idola Specus*, or Idols of the Den.

As the *Idola Tribus* were those sources of error which beset the mind of man from its common humanity—spring from the *propria* of the human species—so the *Idola Specus* are those which beset the mind of each individual man, from the circumstances of his individual position—arise from the *accidentia* of each individual of the race—such as his birth, his occupation, his education, his studies, his constitutional differences, &c. These have much power over the understanding, and more than the individual surmises as existing in his own case. The quaint name that Bacon gave them is founded on an analogy more than usually fanciful,* which he has borrowed from Plato; it is that of a man

* It was an age of fanciful analogies, and Bacon in a state-paper describes the letter of a lady to Queen Elizabeth

who, having been all his life shut up in a cave, is suddenly admitted to a view of the exterior world: his ideas of things in general would be subject to error, from the totally different circumstances in which he had formed the basis of his individual knowledge. So a man is apt, from his own peculiar prejudices, to take contracted or erroneous views of things in forming their general notions. ‘Let contemplative wisdom, then,’ says Bacon,* ‘proceed to dislodge and chase away the Idols of the Den, which arise principally from prevalent studies: excess of composition and division; affections for times; and the great or small size of objects.’

The third general head comprehends the *Idola Fori*, or Idols of the Market-place, or those causes of error which have their seat in the vague use of words or phrases, and which arise from our abuse of language in our common intercourse with mankind. They are innumerable, and are such as arise from names being taken from false analogies; from

as written in ‘a certain violent and *mineral* spirit of bitterness.’

* Novum Org. Lib. 1, Aph. lxii.

theories which have been proved to be false, &c.; from names which have no real object in nature corresponding to them, as *conquest*, &c. ; and from names which are held by different individuals in different senses, as *reasoning*, *metaphysics*, &c.

The last of the general divisions consists of the *Idola Theatri*, or Idols of the Theatre, the title which Bacon gives to those sources of error which lie in false theories and systems of philosophy. ‘The systems of philosophy,’ he says,* ‘which have hitherto been invented and explained, are but so many stage-plays, which have exhibited nothing but fictions and theatrical worlds.’ He divides these systems into three classes : 1. The Sophistic or Rational School, so called on account of the false pretensions of the philosophies of this class, which are founded on slight and deficient indications, the rest being supplied by the imagination ; 2. The Empirical School, whose theories are founded on inadequate Inductions ; i. e. the facts from which they have been generalised have been too few in number ;

* *Novum Org. Lib. 1, Aph. lxiii.*

and, 3. The Superstitious School, whose theories are partly religious and partly philosophical; the one being made subservient to, or accommodated so as to accord with, the other; which unnatural combination of things human and divine produces not only false and vain systems of Philosophy, but also erroneous and heretical opinions in Religion.

Having stated the preliminary impediments to accuracy of observation, Lord Bacon next gives a double system of logical method by what he calls, 1. The Tabular arrangement of Inductive Facts=*Tabulæ comparentiæ Instantiarum ad intellectum*, and 2. The Prerogatives of Instances, or the comparative value of the facts made use of=*Prerogativæ Instantiarum*.

We shall not enter upon these, as they are of little or no practical utility nowadays, further than to say of the former, that after the three tables, 1. Of positive facts; 2. Of negative facts; and 3. Of comparative facts, there comes a rejection of such facts as are not to the purpose, and then the *Vindemiatio* or vintage, the gathering in of the fruit of the whole; and of the latter, that the well-known and familiar *Instantia Crucis*, or Finger-post

Fact, is the fourteenth of the twenty-seven kinds which he enumerates.

Had Bacon completed the *Novum Organum*, he would have treated of the eight following heads, viz.:—1. *Adminicula inductionis*; 2. *Rectificatio inductionis*; 3. *Varietas inquisitionis pro naturâ subjecti*; 4. *Prærogativæ naturarum quatenus ad inquisitionem, sive id quod inquirendum est prius et posterius*; 5. *Termini inquisitionis, sive synopsis omnium naturarum in universo*; 6. *Deductio ad Praxin, sive id quod est in ordine ad hominem*; 7. *Parascevæ ad inquisitionem*; 8. *Scala ascensoria et descensoria Axiomatum*.

CHAPTER XII.

OF FALLACIES IN THE MATTER.

WE may now glance at the fallacies which lie in the *matter* and in the *form and matter* of a syllogism. The same observations which were made as to the detection of fallacies in *form*, apply, *mutatis mutandis*, to those we are now considering.

The first which we shall mention is *Fallacia Accidentis*, where at least one of the extremes of the conclusion which is assumed to agree necessarily with the *middle* term, agrees or disagrees with it not *necessarily*, but *accidentally*. 'The example of this fallacy given by Aristotle is, Coriscus is different from Socrates; Socrates is a man; therefore, Coriscus is different from a man. The fallacy lies in assuming that whatever is different from a given subject is incompatible with all the predicates of that subject. The reasoning is thus

illogical:—Socrates is a man; Coriscus is not Socrates; Coriscus is not a man.* The above is not a *F. accidentis*. *Socrates* is the middle term; it is necessarily true both that *Coriscus is not Socrates*, and that *Socrates is a man*; the fallacy lies in a violation of the third general rule of the syllogism, the *predicate* is distributed in the conclusion, and not in the major premise.† There is not a better example than the old one—

Quod emisti comedisti,
Crudum emisti,
Crudum comedisti.

where, as Wallis says, the *crudum* is not the *quod*, but the *quale emisti*; it was only *accidental* to the *quod emisti*, but assumed to be *essential*.

The next which we shall mention is the *Fallacia Ignorationis Elenchi*, or the fallacy of a false contradictory. An *elenchus* is the conclusion of an argument viewed subjectively to the opponent's position, of which it should be the contradictory. The *elenchus* will be false

* Mansel.

† All fallacies of this kind, i. e. which are violations of 2nd or 3rd general rules of syllogism are immediately detected by the *explicit quantification of the predicate*.

if it does not predicate, . 1. *Of the same thing*; 2. *Of the same part of it*; 3. *Of it compared with the same thing*; 4. *As existing at the same time*.

The *Fallacia Ignorationis Elenchi* is arguing beside the point.

The third is, *A non causâ ut causâ*, or attributing an effect to a false cause. This is not a distinct kind of fallacy, but one of the worst and most general kinds of *Fallacia Accidentis*. The same may be said of its converse, *Fallacia Consequentis*.

Fallacia Petitionis Principii, is where the truth of one of the premises is dependent on the truth of the conclusion. The conclusion of a syllogism must be contained in the premises, and a syllogism must be convertible, but the premises must be true independently of the conclusion, so even were the conclusions hypothetically false, their truth would not be affected, as is assumed in the reduction of a syllogism by contraposition. It is thus easy of detection.

Another form of fallacy in the matter is *Fallacia Plurium Interrogationum*, or *Sophisma Polyzeteseos*, also called the *Sorites* or *Acervus*,

which by attempting to make the adversary assign a limit to a relative notion, pretends that from the impossibility of doing so, no limit can possibly be assigned to it. Thus, 'does one grain of corn make a heap? no; do two? no; do three? no; and so on *ad infinitum*. It is a very easily settled fallacy, for the respondent has only to fix upon a point when the notion transcends the limit, and the interrogator cannot possibly refuse to accept it.

The last fallacy which we shall notice is the *Fallacia Heterozeteseos*, sometimes, but erroneously, called *Plurium Interrogationum*; it is the fallacy of *Counter-questioning*, or of a false Dilemma. It is requiring a categorical answer to a question, which is at least in reality, if not in form, twofold, and which requires a disjunctive answer, for one part of the question should be answered in the affirmative, the other in the negative. It varies much in form, though the principle is the same. The following is an example:—

Was Luther a renegade and a reformer?

This cannot be answered categorically, for one must be affirmed and the other denied.

CHAPTER XIII.

OF THE DEFINITION OF LOGIC.

IN adopting the Definition of Logic,* which we gave at the commencement of this work, we so decided because we considered that, upon the whole, it was the most satisfactory, the most readily understood, and the freest from objection. There are several points in it, however, which must be commented on.

Is Logic a Science only, or an Art, or both? Considering a Science to be simply a connected body of principles, viewed objectively, and without any regard to their application, then Logic as the principles of Reasoning, whether the Reasoning be the formation of concepts, the formation of propositions, or the drawing of inferences, either by Deduction or Induction, is unquestionably a Science. It can be studied and taught without any other than abstract

* From Archbishop Whately.

formulas, and is in so far as much a Science as Geometry or Algebra. If Reasoning were never practically applied the Science of Logic would yet exist, as the Science of Mathematics would, were Practical Mechanics or Mensuration things unknown. But Reasoning is practically applied, and when so applied the rules of its application must be sought for in the principles of the Science of Logic ; what, then, are we to call the Art which is constituted by these rules, and their application ? There is only the same name for it—Logic. Dr. Thomson says : ‘ The distinction between Science and Art is that a Science is a body of principles and deductions to explain the nature of some object-matter ; an Art is a body of precepts with practical skill for the completion of some work.’ In the former part of this double definition, we would read ‘ principles ’ instead of ‘ principles and deductions ; ’ and in the latter part we would omit the words ‘ with practical skill,’ as the latter may or may not be acquired by the practice of the Art, but is not essential to its existence. An Art would be none the less an Art were there not a single individual possessed of sufficient skill to prac-

tise it. In the next sentence he gives a description of Science and Art which we must consider much better than his definition: ‘A Science teaches us to know, and an Art to do;’* the former declares that something exists with the laws and causes which belong to its existence; the latter teaches how something must be produced.’ Putting this into other words, *The object-matter of a Science is abstract; the object-matter of an Art is concrete.* Dr. Thomson divides Logic into *pure* and *applied*, but he claims the name of Science for both parts. We shall quote and consider his reasons for not allowing applied Logic to be reckoned an Art. ‘Now,’ he says,† ‘in the popular meaning of the word Logic, no doubt the notion of an Art is more prominent; to be able to reason better, and to expose errors in the reasoning of others, is supposed to be the object of this study; but those writers who have followed out this view have been compelled to go over too wide a field for any one system. Logic must be the widest of all

* ‘The object of science is *knowledge*, the objects of art are *works*.’—Whewell, *Phil. Induct. Sc.*, Book XI. cap. 8.

† *Laws of Thought*, *Introd.* § 3.

Arts or Sciences, because thinking, which is its object-matter, belongs to all the rest; it is *Ars Artium*, the Art which comprehends all others, because its rules apply to every subject on which the human mind can be engaged. If, then, it is to be taught as an Art, it should contain specific rules for reasoning or thinking in every region of thought; it must propose to itself nothing less than to enable men of the most various capacities to apply a set of principles to effect the work of thinking correctly under all circumstances. And the consequences are, an enormous expansion, in the first instance, from the huge mass of heterogeneous materials; and a consciousness of incompleteness in the second, since it is impossible to suppose that so vast a work has ever been completely achieved.' The whole gist of this objection lies in the fallacy of considering that Logic as an Art has to do with the matter to which it is applied. But Logic is not like a mechanical Art, different according to what it fashions, as the Art of working in brass may differ from the Art of working in iron. The object-matter of logical Art is, *the Reasoning*, not, *the thing reasoned of*. A fallacy

is the same fallacy while it is of the same form, whether the matter of the Reasoning be theology or law; it is the manner of the Reasoning alone that Logic has to deal with.

Sir William Hamilton, also, considers Logic to be purely a Science, but he divides the Sciences into *theoretical* and *practical*, and then, naturally enough, says, ‘I am well aware that it would be no easy matter to give a general definition of Science as contradistinguished from Art; and of Art as contradistinguished from Science.’* While Mr. Mill says,† ‘Logic, then, is the science of the operations of the understanding which are subservient to the estimation of evidence; both the process itself of proceeding from known truths to unknown, and all intellectual operations auxiliary to this;’ he still considers it to be both a Science and an Art; for in another place he says: ‘Logic, then, comprises the science of reasoning, as well as an art founded on that science.’ And again: ‘The analysis of the instruments we employ in the investigation of truth is part of the analysis of the investigation itself; since no Art is complete

* Lect. on Log., V. I, p. 11. † Logic, Introd., § 7.

unless another art, that of constructing the tools and fitting them for the purposes of the art, is embodied with it.'

Dr. Whately's own words remain the best definition and description of Logic: * 'Logic, in the most extensive sense which the name can with propriety be made to bear, may be considered as the Science and also the Art of Reasoning. It investigates the principles on which argumentation is conducted, and furnishes rules to secure the mind from error in its deductions. Its most appropriate office, however, is that of instituting an analysis of the process of the mind in Reasoning; and in this point of view it is strictly a *Science*, while, considered in reference to the practical rules above mentioned, it may be called the *Art* of reasoning.'

Sir William Hamilton objects strongly to Whately's definition, and without any just ground. He first says† that, 'it is incorrect, inasmuch as it limits the object-matter of Logic to that part of the Discursive Faculty which is especially denominated Reasoning. In this view, Logic is made convertible with

* Elements of Logic, Introd. † Lect on Log., V. I, p. 30.

Syllogistic. This is an old error, which has been frequently refuted, and into which Whately seems to have been led by his guide, Dr. Wallis.' The old error is, however, not Dr. Whately's making Logic convertible with Syllogistic, but Sir William Hamilton's making Reasoning convertible with Syllogistic—taking the part for the whole,—and saying that reasoning is only 'a part of the Discursive Faculty,' while, in reality, what he has dubbed the Discursive Faculty is precisely the Faculty or Mental Power called *Reason* in the proper sense of the term. *Reasoning* is the operation of that *Faculty*, and not the *Faculty* itself. It is Psychology which has the Faculty as part of its object-matter; and Sir William Hamilton is right when he defines Thought, for his purpose, as 'the acts of the understanding, properly so called, that is, of the Faculty of Comparison, or that which I distinguished as the Elaborative or Discursive Faculty.'

Taking Sir William Hamilton's own doctrine of a proposition's being an equation, and then referring to his statement,* 'In regard

* Lect. on Log., V. I, p. 275.

to the act of Reasoning, nothing can be more erroneous than the ordinary distinction of this process, as the operation of a Faculty different in kind from those of Judgment and Conception. Conception, Judgment, and Reasoning, are in reality only various applications of the same simple Faculty—that of Comparison or Judgment.’ Why should we not apply the term Reasoning to the three, instead of Judgment, when they all mean the same thing? The term Reasoning has been most unjustly limited or extended, not only in common parlance, but even by scientific writers. At one time Reason is merely the Power exercised in Deduction—the Faculty which enables a man to draw a syllogism; at another, it is coextensive with the Human Intellect, and includes in one generic term all the Mental Powers. A little consideration will show that we have no right to assume a separate Power of the Mind to enable us to draw a syllogism from that by which we form a concept or a proposition. How do we form our simplest concepts? By comparing our perceptions; by abstraction and generalization; by applying the fundamental Laws of Thought:

and this is syllogizing. It is not necessary that we put our thoughts into formal propositions; it is not even necessary that we should know the use of language; language is only of use for communicating with others; we can reason without it as well as with it; it but extends the sphere in which our Reason operates.*

Again, the immediate comparison of two concepts is as much an act of Reason as the mediate comparison of them by the aid of a third concept; truly we employ in the latter case another axiom, but it is applied by the same Mental Power. Deprived of Reason, we might still have had our Perceptions, and our Remembrances of them; but we could not have formed what is properly called a concept; we could not have classed our Perceptions; our ideas of Existence, Time, Space, and Number, would have lain dormant in the mind; the Will, the Passions, and the Desires would have been inactive and objectless; and we should, in a word, have been

* The tacit assumption that the mind cannot understand and act upon a proposition unless it be first formally stated in words, and recognized in its new guise, is one of the grounds of fallacy in Locke's argument against Innate Ideas.

absolutely, and to the full extent of the term, imbecile. If Reasoning, then, be the operation of the Reason, it must equally apply to our concepts, our propositions, and our syllogisms; it is in this sense equal to *Ratiocination*, properly so called, which means the process, not the product, of Reasoning.

If we go further, however, we find that although the *Will*, the *Appetites*, *Desires*, *Passions*, *Affections*, &c.—which with *Memory*, *Perception*, and *Reason*, complete the catalogue of the Mental Powers and States—may be ever so much intermingled in their operation with the operation of Reason, they are totally distinct from it, and the *Exclamations*, *Interrogations*, *Requests*, *Commands*, &c., which are their manifestations in language, are admittedly extra-logical.

When Sir William Hamilton defines Logic to be ‘*The Science of the Laws of Thought as Thought*,’ he has at once to limit the significance of the word *Thought*, not to a legitimate and real meaning in contradistinction to a false and illegitimate one, but to a particular meaning, a portion only of its full and real meaning; a part cut off to suit a purpose, in

the same way that Reasoning in the sense of Syllogistic bears only a part of *its* real meaning. He has, then, having thrown overboard the true signification of the term Reasoning, to get a name for the Faculty thus left innominate, and he calls it the Elaborative, or Discursive Faculty. But it is not sufficient merely to limit the signification of the term *Thought*; there are Laws of Thought, even so limited, with which Logic has nothing whatever to do; we must have a further restriction, and say, 'the Laws of Thoughts as Thought,' which, we are told, means 'the Laws of the Form of Thought,' or the 'Formal Laws of Thought,' — the last, the best of the three ways of putting it. It would be no disadvantage to Dr. Whately's definition, were there a term introduced into it, which would make it clear at once that Logic has nothing to do with the matter of Reasoning, and 'the Science, and Art of the Form of Reasoning' would be an improvement. However, Sir William Hamilton in his objections to it does not notice this, but gives as his second objection,*—'in the second place,

* Lect. on Log., V. I, p. 31.

this statement is incorrect, inasmuch as it makes the process, or, as he also calls it, the operation, of Reasoning the object-matter of Logic. Now a definition which merely affirms that Logic is the Science which has the process of Reasoning for its object, is not a definition of this Science at all; it does not contain the differential quality by which Logic is discriminated from other Sciences; and it does not prevent the most erroneous opinions (it even suggests them) from being taken up in regard to its nature. Other Sciences, as Psychology and Metaphysics, propose for their object (among the other Faculties) the operation of Reasoning, but this considered in its real nature; Logic, on the contrary, has the same for its object, but only in its formal capacity; in fact, it has in propriety of speech nothing to do with the process or operation, but is conversant only with its laws. Dr. Whately's definition is, therefore, not only incompetent but delusive; it would confound Logic and Psychology and Metaphysics, and tend to perpetuate the misconceptions in regard to the nature of Logic which have been so long prevalent in this country.'

Reasoning, it may be said in answer, can never be any part of the object-matter of Psychology; *Reason* is part of *that* object-matter. Reasoning may be considered by Psychology as the operation of Reason, but that is viewing it *subjectively*; Logic views it *objectively*. Metaphysics, again, may treat in other parts of its ill-defined extent of the conclusions arrived at by Reasoning, of their material truth or falsehood, or of the material truth or falsehood of the premises employed; but she has nothing to do with the Reasoning itself, from the formation of the concepts to the most elaborate conclusion; if she would test the Reasoning, she must employ Logic to do so.

Mr. Mill, as we have seen, says that 'Logic comprises the Science of Reasoning, as well as an Art founded on that Science,' but he hesitates to adopt this as his definition, on account of the ambiguity of the term Reasoning. The widest range which he allows it, includes both Induction and Deduction, but he still limits it to 'inferring any assertion from assertions already admitted,' thus excluding the formation of concepts, or the doctrine of names, and also

the doctrine of propositions. Accordingly he ultimately defines Logic* to be '*the Science of the operations of the Understanding which are subservient to the estimation of Evidence; both the process itself of proceeding from known truths to unknown, and all Intellectual operations auxiliary to this.*' This definition is not bad upon the whole, but the second clause is clumsy, and supplementary to, not explanatory of, the first, as it appears to be. 'The process of proceeding from known truths to unknown' is not merely the estimation, but also the employment of Evidence; while 'all the Intellectual operations auxiliary to this' would make the object-matter of Logic to be the operation of all the simple Intellectual Powers—Perception, Memory, and Reason. Had Mr. Mill defined Logic to be '*the Science of the operations of the Understanding in the estimation and employment of Evidence,*' he would have avoided Scylla and shunned Charybdis.

Dr. Thompson defines Logic similarly to Sir William Hamilton, as '*the Science of the Formal Laws of Thought*;' both of their definitions being lineal descendants of the Port Royal

* Logic, Introd. § 7.

definition of Logic, as '*the Art of Thinking*;' the higher title of a Science, corresponding to the increased antiquity of the family.

Dr. Whewell has defined Logic somewhat loosely as '*a system which teaches us so to arrange our reasonings that their truth or falsehood shall be evident in their form.*'* And again, as '*a system of doctrine which lays down rules for determining in what cases pretended reasonings are and are not demonstrative.*'† Such definitions are not to be wondered at, even as proceeding from so truly logical and scientific a mind as Dr. Whewell's, when we consider that Logic is not the object-matter of his speculations, but is only treated of by him subjectively to the Philosophy of Science. It is somewhat strange, however, to find him in the Essay from which we have last quoted, *opposing* Mathematical Demonstration to Logic, and preferring the former as a better system of mental training; while really it is only one application of Deductive Logic, though a strict one, being concerned only with necessary truth. What-

* Ph. Ind. Sc., B. XI, c. 6, § 10.

† Ess. on Math. Reasoning, § 3.

ever good Mathematical Demonstration may do in accustoming the mind of the student to clear and consecutive thought, *that* Logic must do, and *more*. In fact, Dr. Whewell most singularly confines Logic to Reasoning about contingent truth ; and confines—which is less to be wondered at—the meaning of Reasoning entirely to Syllogistic.*

* To show the loose and erroneous use of the terms *logic* and *logical*, even by those who are habitually conversant with the niceties of language, we quote the following paragraph:—

‘The preceding chapters have paved the way for a distinction between the *historical* analysis of a language and the *logical* analysis of one. Let the present language of England (for the illustration’s sake only) consist of 40,000 words. Of these let 30,000 be Anglo-Saxon, 5,000 Anglo-Norman, 100 Keltic, 10 Latin of the first, 20 Latin of the second and 30 Latin of the third period, 50 Scandinavian, and the rest miscellaneous. In this case the language is considered according to the origin of the words that compose it, and the analysis is an *historical* analysis. But it is very evident that the English, or any other language, is capable of being contemplated in another view, and that the same number of words may be very differently classified. Instead of arranging them according to the languages whence they are derived, let them be disposed according to the meanings that they convey. Let it be said, for instance, that out of 40,000 words 10,000 are the names of natural objects, that 1,000 denote abstract ideas, that 1,000 relate to warfare, 1,000 to

It is a common idea that Logic is a useless study, or, that if it be beneficial, 'its more valuable fruits are to be found rather in the training which the mind unconsciously receives, than in the conscious employment of knowledge in the formation and examination of reasonings, and that both, in respect of the true character of the science, are secondary and accidental results—not primary and essential features.' * What can be this training which the mind unconsciously receives? If it be the habit of reasoning with increased precision, of working more steadily and deliberately towards an end, of being less easily diverted from the true line of thought by irrelevant matter which has but a seeming air of being pertinent to the subject, then surely we cannot call this a secondary or an accidental result. Logic cannot teach us the investigation of truth ; it but assists us in our investigation to free ourselves from error. It

church matters, 500 to points of chivalry, 1,000 to agriculture, and so on throughout. In this case the analysis is not historical but *logical*; the words being classed, not according to their origin, but according to their meaning.' —*Latham's 'The English Language,'* P. II, § 388.

* Mansel.

would never give a man the idea that, if a straight line fall upon two parallel straight lines, it will make the interior angles on the same side of it equal to two right angles ; but when the idea is once obtained, Logic, and Logic alone, can show that it is correct, and that every other is wrong. The demonstrations in Euclid are true, not because they are *Mathematical*, but because they are *Logically correct*. It is true that the mass of the moon is the 90th part of the mass of the earth, because in proving it, we have proceeded logically upon the data which we ascertain by observation, and not because it is a question of Physical Science. It would be equally a question of Physical Science if we asserted that ‘the moon is made of green cheese.’ Bacon called Logic the ‘*Ars Artium*,’ and every one since has repeated it. Had his idea of it not been a little defective, he would also have called it the *Scientia Scientiarum*. It is, *Scientia Scientiarum et Ars Artium*, not because it contains within itself all Science and all Art, but because no Art or Science can advance a step without it.

It is natural that we undervalue what we most commonly use, though its import-

ance may be really greater than that of all those more unfrequent objects that interest our minds and engage our immediate attention. We are unconscious of thousands of muscular efforts, every one of which is the result of our volition, and necessary to our movements ; but because we can move equally well without investigating their nature, or knowing the muscles that we call into play, is there no use or interest in the study of Anatomy ? Without it, we can tell the apparent tumour or the open sore that interferes with our action and paralyses our arm, but can we know as well how that abnormal affection acts, or can we as surely and as quickly set about its cure or its eradication, as when we can lay down the form of every muscle, and the course of every vein and artery ? Assuredly we cannot. Still less can we when uninstructed explain why the arm may be useless, when no cause is obvious to our external observation ; or detect, it may be, the incipient cancer which is eating to the bone. Error is the disease of Reasoning. It may be so gross and glaring, so full upon the surface, that the commonest observation must detect it, or it

may be hidden in the intricacies of verbal complication, glossed over with the seemingly healthy tissue of regular form, and specious enunciation. Without a knowledge of Logic we shall, in the first case, be clumsy operators at the best, while in the second we shall puzzle blindly over the cause of our difficulty, or be the victims of the mischief that our unskilfulness conceals from us. But Logic is, like muscular effort, so unremittingly our companion from the cradle to the grave, performed so constantly and with so little call on our attention, that we readily think it needless to study it as a Science, or learn its rules as an Art.

To the student all Science is interesting for its own sake, and none more so than that which tells him how he acquires his knowledge, and how he must use it to use it aright. Accordingly we find that, in all those ages in which Philosophy has been cultivated by man, Logic has been a favourite pursuit—sometimes explicitly as a Science, sometimes implicitly as a part of the great whole. It still retains its place, though the mischief which its followers did it, when they lowered it from its legitimate sphere

to be but the Science of quibbling disputation—the *legerdemain* of language—brought upon it an opprobrium from which only its real interest and utility could ever have freed it. Such writers as Dr. Whewell, who have shown its immediate and necessary connection with the progress of Science, and the advancement of the Knowledge, and therefore, of the happiness, of man, have done much to restore it to its proper position in general estimation. Men are not now satisfied with the dim idea that ‘there is something wrong somewhere’ in an argument; they must be able to detect the Fallacy at once, and expose it; they have not the time now to dream over a dogma for centuries; hours must do the work of years in bygone times. He who thinks not with the rapidity of the age, must give up the race of scientific enquiry, and leave it to others more active and expert.

APPENDIX.



Logic=διαλεκτική=*Logica*, has been divided in various ways.

- | | | |
|---|-------|--|
| 1 | Logic | { i. General=Abstract = Pure = διαλεκτική χωρίς πραγμάτων= <i>Logica docens</i> .
ii. Special = Concrete=Applied = διαλεκτική ἐν χρήσει ἢ γυμνασία πραγμάτων= <i>Logica utens</i> . |
| 2 | Logic | { i. Objective= <i>Logica systematica</i> .
ii. Subjective= <i>Logica habitualis</i> . |

Sir Wm. Hamilton divides General Logic into—1. Pure, and 2. Modified, and subdivides these as follows :—

- | | | | | |
|-----|----------------|--|--|---|
| I. | Pure. | { i. Stoicheiology,
or the Doctrine
of Elements. | { 1. Noetic—Nomology, Doctrine of
the Fundamental Laws of
Thought.
2. Dianoetic—
Dynamic. | { a. Conception—
Ennoematic.
b. Judgment—
Apophantic.
c. Reasoning. |
| | | { ii. Methodology,
or the Doctrine
of Method. | { 1. Clear Thinking—Definition or
Illustration.
2. Distinct Thinking—Division.
3. Connected Thinking—Probation
or Proving. | |
| II. | Modi-
fied. | { i. Truth and Error
—Certainty and
Illusion.
ii. Impediments to
Thinking, with
Remedies.
Those impedi-
ments arise from
iii. The Aids or
Subsidiaries to
Thinking—
through . . . | { 1. The Mind.
2. The Body.
3. External Circumstances. | { 1. The Acquisition of Knowledge.
2. The Communication of Know-
ledge. |

The common division of the Ancient or Aristotelian Logic was into—

1. Simple Apprehension=*Apprehensio simplex*.
2. The Doctrine of Propositions=*Judicium*.
3. Reasoning=*Ratiocinatio*.

Simple Apprehension=*περὶ τῆς πρώτης ἐννοίας=νοητική*—
The Doctrine of Terms=*of Names=of Concepts=of Ideas*
=de Vocibus, &c.

Judgment=*Doctrine of Propositions=περὶ τῆς κρίσεως=*
ἀποφαντική=Judicium.

A Proposition=*ἀπόφανσις=propositio=prædicatio=enun-*
ciatio, &c.

Reasoning=*συλλογισμὸς=διαλεκτική=διαλεκτική πρὸς χρῆσιν*
=ratiocinatio=argumentatio, &c.

Terms are—1. Simple; 2. Complex; 3. Decomplex.

Simple Terms are—1. Categorematic; 2. Syncategorematic;
3. Mixed. They are also—1. Common; 2. Definite;
3. Indefinite; 4. Positive; 5. Privative; 6. Negative;
7. Univocal; 8. Equivocal; 9. Analogous; 10. Concrete;
11. Abstract; 12. Absolute, or non-relative; 13. Relative;
14. Agreeing; 15. Opposite; 16. Of primary or of secondary
intention; 17. Connotative.

A Predicable is, *nomen commune univocum secundæ intentionis*.

The Predicables are—1. Genus=*γένος*; 2. Differentia=*διαφορά*;
3. Species=*εἶδος*; 4. Proprium=*ἴδιον*; 5. Accidens=*συμβεβηκός*.

A Genus may be—1. Genus summum=*γένος γενικώτατον*;
or 2. Genus subalternum=*γένος ἐπ'ἀλληλον*; or 3. Genus
proximum=*γένος ἐγγύτατον*.

It is predicated in *quid*=*ἐν τῷ τί ἐστὶ*.

A Species may be—1. Species infima, or ultima, or
specialissima=*εἶδος εἰδικώτατον*; or 2. Species subalterna, or
media=*εἶδος ἐπ'ἀλληλον*.

It is predicated in *quid*.

A Differentia is predicated in *quale quid*, *ἐν τῷ ποῖον τί*. It
may be of two kinds—1. Generic, the Differentia of Genera

subalterna, and of *Species subalternæ*; or 2. *Specific*, the *Differentia* of a *Species infima*.

A *Proprium* is predicated in *quale quid*.

It is also either—1. *Generic*; or 2. *Specific*.

An *Accidens* is predicated in *quale quid*.

It is—1. *Separable*; or 2. *Inseparable*.

The Aristotelian *Categories* or *Predicaments*=κατηγορίαι=*prædicamenta*, are—

1. Οὐσία—*Substantia*—Substance.
2. Πόσον—*Quantitas*—Quantity.
3. Ποῖον—*Qualitas*—Quality.
4. Πρὸς τί—*Relatio*—Relation.
5. Ποῦ—*Ubi*—Where.
6. Πότε—*Quando*—When.
7. Κεῖσθαι—*Situs*—Posture.
8. Ἐχειν—*Habitus*—Habit.
9. Ποιεῖν—*Actio*—Action.
10. Πάσχειν—*Passio*—Suffering.

Division=διαίρεσις=*Divisio*.

A *Whole* is—1. *Real* or *Physical*; or 2. *Logical*; or 3. *Ideal* or *Metaphysical*.

Definition=Ὁρισμός=*Definitio*, is—1. *Nominal*; or 2. *Real*. *Real Definition* is—1. *Accidental*; or 2. *Essential*. *Essential Definition* is—1. *Physical*; 2. *Logical*; 3. *Metaphysical*.

The Parts of a Proposition are—1. The *Subject*=*Subiectum*=ὑποκείμενον; 2. The *Copula*=*Copula* or *apprædicatum*=προσκατηγορούμενον; 3. The *Predicate*=*Prædicatum*=κατηγορούμενον.

The *Subject* and *Predicate* together are called the Extremes=*Termini*=ἄκροι or πέρατα.

A *Proposition*=ἀπόφωσις=*Propositio*, varies in—1. *Substance*; 2. *Quality*; 3. *Quantity*.

I. In *Substance* it is—1. *Categorical*; or 2. *Hypothetical*. *Categorical* are—1. *Pure*; or 2. *Modal*.

Modal Propositions are—1. *Adversative*; 2. *Relative*; 3. *Causal*; 4. *Comparative*; 5. *Exclusive*; 6. *Exceptive*; 7. *Inceptive*; 8. *Desitive*, &c. &c.

Hypothetical Propositions are—1. *Conditional*; or 2. *Disjunctive*.

The *Quality* of a Proposition is—1. *Essential*; or 2. *Accidental*. Its *Essential Quality* is—1. *Affirmative*; or 2. *Negative*. Its *Accidental Quality* is—1. *True*; or 2. *False*.

The *Quantity* of a Proposition is either—1. *Universal*; or 2. *Particular*; or 3. *Singular*; or 4. *Indefinite*.

Universal Propositions=*Propositiones universales*=προτάσεις αἱ καθόλου.

Particular Propositions=*Propositiones particulares*=προτάσεις μερικαί.

Singular Propositions=*Propositiones individuales* or *singulares*=προτάσεις αἱ καθ' ἑκάστων.

Indefinite Propositions=*Propositiones indefinitæ*=προτάσεις ἀδιόριστοι.

All Propositions are also—1. *Simple*; or 2. *Compound*.

When two Propositions have the same form and matter, though not the same terms, they are *Equipollent*=*equipollentes*.

If they are only in some respects the same, but differ in others, they are *Relatively identical*, or *Cognate*=*Cognatæ*. If they have a similar *subject*, the *predicates* are *Disparate*=*Disparata*; if they have a similar *predicate*, the *subjects* are *Disjunct*=*Disjuncta*.

When two Propositions differ only in *quantity*, the *Universal* is the *Subalternant*=*subalternans* (=superordinate—Sir Wm. H.); the *Particular* is the *Subalternate*=*subalternatum*.

The *Opposition*=*Oppositio* of Propositions is either—1. *Contradiction*=*contradictio*=ἀντίφασις; or 2. *Contrariety*=*contrarietas*=ἐναντιότης.

The *Conversion*=*Conversio*=ἀντιστροφή of propositions is—1. *Simple Conversion*=*Conversio simplex*=ἀπλή ἀντιστροφή; or 2. *Accidental Conversion*=*Conversio per accidens*=ἀντιστροφή ἐν μέρει, or κατὰ μέρος; or 3. *Conversion by contraposition*=*Conversio per contrapositionem*=ἀντιστροφή σὺν ἀντιθέσει.

The mnemonic rule of Conversion is—

Feci simpliciter convertitur Eva per accid.

Ast o per contrapos. sic fit conversio tota.

A *Syllogismus*=*Syllogismus*=συλλογισμός consists of two *Premises*=*Propositiones præmissæ*, or *Sumptiones*=προτάσεις, or λήμματα, and a *Conclusion*=*Conclusio*=συμπέρασμα.

The two *Premises* taken together are sometimes called the *Antecedent*=*Antecedens*, and the *Conclusion* is then called the *Consequent*=*Consequens*.

The *Major Premise*=*Propositio*, or *Propositio major*, or *Sumptio*, or *Sumptio major*=πρόσληψις, or πρότασις ἡ μείζων, or λήμμα τὸ μείζον.

The *Minor Premise*=*Propositio minor*, or *Sumptio minor*, or *Subsumptio*=πρότασις ἡ ἐλάττω, or λήμμα τὸ ἐλάττω.

A *Fallacy* is either—1. *In dictione*=οἱ παρὰ τὴν λέξιν; or 2. *Extra dictionem*=οἱ ἔξω τῆς λέξεως.

The *Fallacies in Dictione* are—1. *Homonymia*, or *Quibble*; 2. *Amphibolia*, or *Ambiguity*; 3. *F. of Composition*; 4. *F. of Division*; 5. *F. of Accent* or *Prosody*; 6. *F. of Figure of Speech*.

The *Fallacies extra Dictionem* are—1. *F. Accidentis*; 2. *F. a dicto secundum quid ad dictum simpliciter*, and *F. a dicto simpliciter ad dictum secundum quid*; 3. *F. Ignorationis elenchi*; 4. *F. a non causa ut causa*; 5. *F. Consequentis*; 6. *F. Petitionis principii*; 7. *F. Plurium interrogationum*.

The *Fundamental Laws of Thought* are—1. *The Law of Identity*=*Principium Identitatis*.

2. *The Law of Contradiction*=*Principium Contradictionis*=ἀξίωμα τῆς ἀντιφάσεως.

3. *The Law of Excluded Middle*=*Principium Exclusionis*=ἀξίωμα διαμετρικόν.

4. *The Law of Reason and Consequent*=*Principium Rationis et Consequentis*.

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